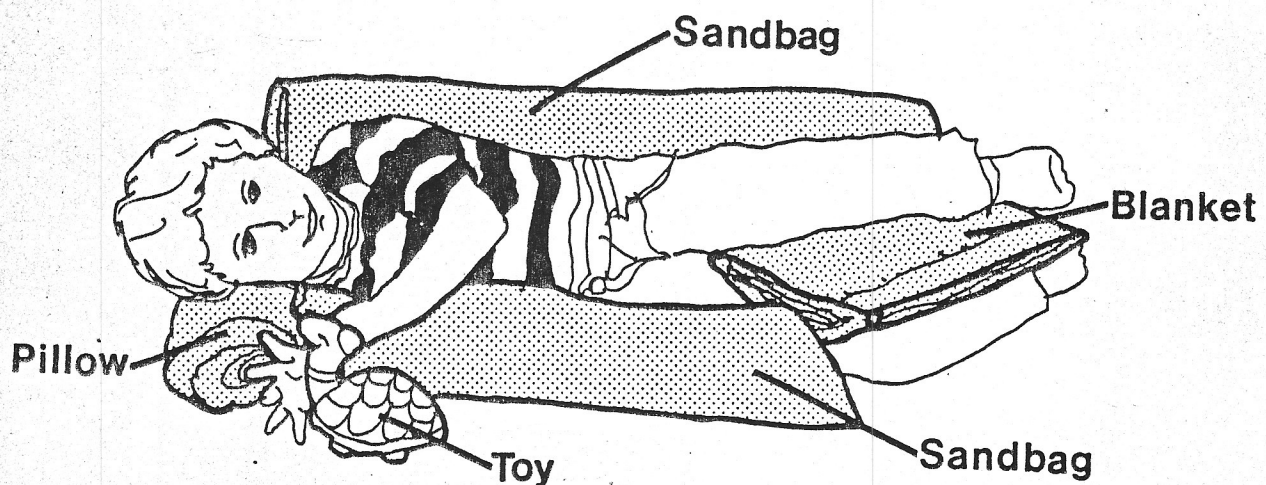


# DESIGNING AND CONSTRUCTING ADAPTIVE EQUIPMENT ON YOUR DESKTOP







DESIGNING AND CONSTRUCTING

ADAPTIVE EQUIPMENT

ON YOUR DESK TOP

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### Tools Needed to Build Equipment in Manual

Scissors	Ice pick
Needle (regular and upholstery)	Wire stripper
Thread	Paint brushes
Hot glue gun	Small pliers
Old electric frying pan (or hot pot to heat water)	Staple gun for 1/4" to 1/2" staples
Drill (wood, metal bits)	All-purpose shears or tin snips
Vise (optional)	
Craft knife	
Sandpaper	
Grommet setter	
Hacksaw (mini will do)	
Pony clamps or 2"-3" C-clamps	
Sewing machine	
Hammer	
Hole punch for paper	
Jigsaw (electric) (wood/plastic blades)	
Rat-tail file	
Screwdriver (regular/phillips types)	
Solder gun (rosin core solder)	
Coping saw	
Electric knife	
Tape measure	
Yardstick	
Tack hammer	
Safety goggles (wear while operating power tools)	





## Construction Pointers

### Sanding

Smooth or coat out rough edges to avoid injury. Make sure the base of a piece of equipment is broad enough in design so that it does not tip easily. Use sandpaper wrapped around a block of wood or adhere a sheet of sandpaper to a piece of board and make a sandpaper board that the item to be sanded may be laid against and moved back and forth. This will allow sanding on a flat level surface.

### Cutting

Be certain the wood is held firmly to avoid vibration when using the power jigsaw to cut. Always start the jigsaw before putting the blade against to or into the wood, plastic or other material to be cut.

Use the tool that's appropriate for the cutting task:

Woodsaw/jigsaw: cut sheets of wood, small boards and plastic or acrylic.

Electric Knife: cut from block or sheets of foam.

Back Saw: Cut small pieces of wood.

Wire Snips: Cut small wire used in switches or battery operated devices.

Scissors: Cut paper, vinyl, flexible material, and cord.

Craft Knife: Cut cardboard and foam core board. Also splinting material.

### Fastening

Use a firm, direct and even hit with the hammer when using the grommet setter.

Use the appropriate nail, fastener, or fastening material.

Common Nail: Attach boards to each other in wood construction.

Brad: Attach small thinner boards to each other or lightweight materials to the boards.

Wire Nail: Attach wire or cord to a surface.

Staple: Attach wire, cord, or fabric to other material.

Upholstery Tack: Attach fabric or velcro to other material.

Nut/bolt: Bolt plastic to a surface or attach metal to metal. A wing nut may be used, if adjustment of the 2 pieces will be desired.

Wood Screw: Attach material or wood to wood especially when there will be vibration or movement that may cause the 2 pieces to work loose. Countersink the screw to avoid injury.

Hot Glue: Attach lightweight fabric or materials to each other and repair small rips, tears and breaks.

PVC Cement: Attach PVC joints and pipes. Be certain to twist the glued joint to set it.

Wood Glue: Use with nails or screws to provide an extra strong hold with wood surfaces.

### **Finishing**

Be sure rough edges and excess material slivers are sanded and smooth. Be certain that all paint used is nontoxic, both the undercoat and the topcoat. Use a good quality, clean brush to apply. Be sure to fill all holes, surface blemishes, and cracks before painting or staining. Use 2 thin coats of undercoat paint and rubdown with sandpaper between each coat and then use 2 top coats for a super finish.



**SECTION I**

**Feeding, Dressing, Hygiene, and Toileting**

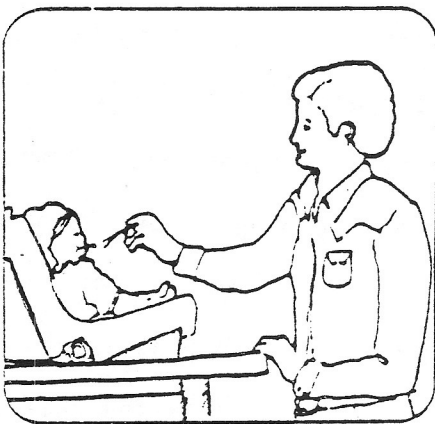


## FEEDING

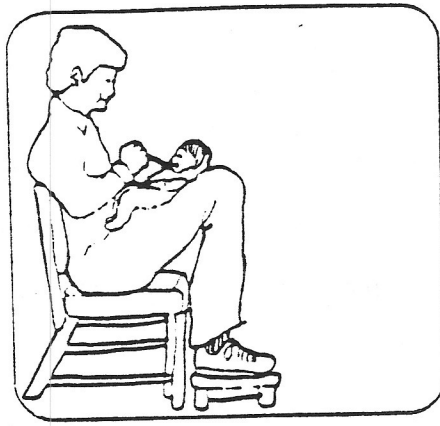
Feeding ourselves is one of our basic life functions. Successful performance of this skill not only meets our necessary nutritional needs but also contributes to both dental and emotional health.

Good feeding behaviors are dependent upon oral motor movements (which become the foundation for later speech development), balance, head and trunk control, grasping patterns, range of motion, and strength. Both feeding and speaking require control of the oral musculature; i.e., lips, tongue, teeth, palate, and jaw. These body parts must be precisely placed and coordinated with the task of breathing (Bailey & Wolery, 1984).

The importance of correct positioning during feeding cannot be overemphasized. Physically disabled individuals of all ages should be positioned with hips and knees flexed at a 90° angle, with feet supported by a flat surface and head positioned at midline. Several ways to facilitate normal postural patterns in the very young child are demonstrated in the following illustrations.







If possible, the older child should use a regular chair in order to practice balancing.

If the child is unable to use a regular chair, use a highchair for the following reasons:

- \* You can sit in front of and slightly below your child's face. The child can then look at you without arching his/her back.
- \* Both your hands will be free for feeding your child.
- \* You can engage in relaxed social interaction by using language modeling and eye contact.
- \* Your child must help hold his/her body erect when sitting in the chair. This will help strengthen weak muscles.
- \* Your child will be in a good position to start self-feeding.
- \* If the belt on the highchair does pull tightly across the stomach, make a new belt by using a piece of cloth webbing 1" or 2" wide. Sew a piece of Velcro to each end. Place belt around child (see checklist above). Take up slack of the belt by wrap ping around the legs of the chair. Then fasten Velcro ends in back of the chair.

Food should be placed and presented at an angle which permits visual access by the individual. The head should flex slightly forward to facilitate swallowing. A person should not be allowed to eat or drink in a reclining position because the likelihood of choking and aspiration is increased.

This section includes suggestions and directions for modifying utensils and other feeding equipment, which will make mealtime a more pleasant experience while maximizing the degree to which the disabled individual may participate in the process.

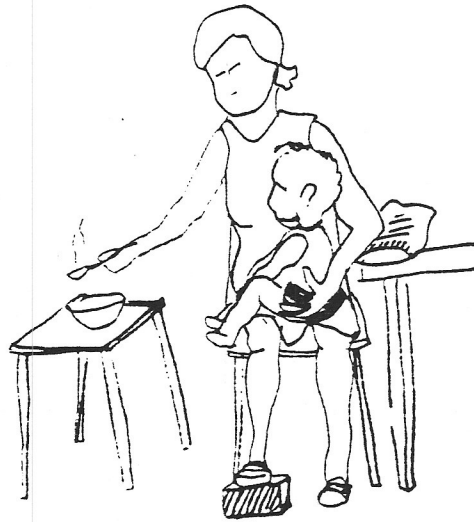
When trying to teach handicapped or nonhandicapped children to eat neatly at the dinner table, there are some techniques which have been proven successful in many settings and should be helpful to parents in teaching their children to eat neatly at the dinner table.

- A. Before the rest of the family begins their meal, take the child by him/herself and sit down at the family table.
  1. Give the child your total and undivided attention, and take as much time as necessary.
  2. If possible, talk your child through the process of picking up his/her spoon, spooning up some food, taking the spoon to his/her mouth, taking a bite, putting the spoon down, putting his/her hands down in his/her lap.
  3. If necessary, provide full guidance by physically guiding the child's hand.
    - a. Begin guidance by molding your hand around the child's hand and guiding him/her through the entire response.

- b. As the child grasps the spoon by him/herself, your guidance is progressively reduced at the hand to a gentle touch.
  - c. Your guidance should then be reduced even more by moving up the arm to the forearm, elbow, upper arm, then shoulder and upper back, always maintaining a light touch unless more guidance is required. This constant contact serves as a reminder to the child that inappropriate responses will be prevented.
4. These steps may take several sittings to accomplish. However, the important thing to remember is to be patient. Be sure to praise your child every time he/she attempts to do more of the skill by him/herself.
- B. As your child advances, graduate him/her to eating with the rest of the family at the dinner table.
- 1. Initially feed him/her prior to the main meal, and while he/she is sitting at the dinner table with the rest of the family, give him/her a cracker to munch on.
  - 2. Then slowly start saving part of the meal to be eaten with the rest of the family. For example, you might want to feed him/her the whole meal with the exception of one or two bites prior to when the rest of the family sits down to eat.
  - 3. Gradually increase the amount of food the child eats with the family and decrease the amount he is eating separately.

Remember: Feeding should be done in a pleasant environment and when the child is ready. To a certain extent, respect the child's preference for food. Introduce new foods slowly, and if possible accompany a new food with

one that is familiar to the child and enjoyed by the child. Finally, be sure to praise your child every time he/she attempts to do more of the skill you want him to do.



Physically disabled individuals of all ages should be positioned with hips and knees flexed at a 90° angle, with feet supported by a flat surface, and with head positioned at midline. Food should be placed and presented at an angle which permits visual access by the individual.

This section includes suggestions and directions for modifying utensils and other feeding equipment, which will make mealtime a more pleasant experience while maximizing the degree to which the disabled individual can participate in the process.

### Quad Quip Holder

**Purpose:** To enable individuals with limited grasp to maintain hold on utensils.

**Suggested Uses:** Use during feeding to increase independence.

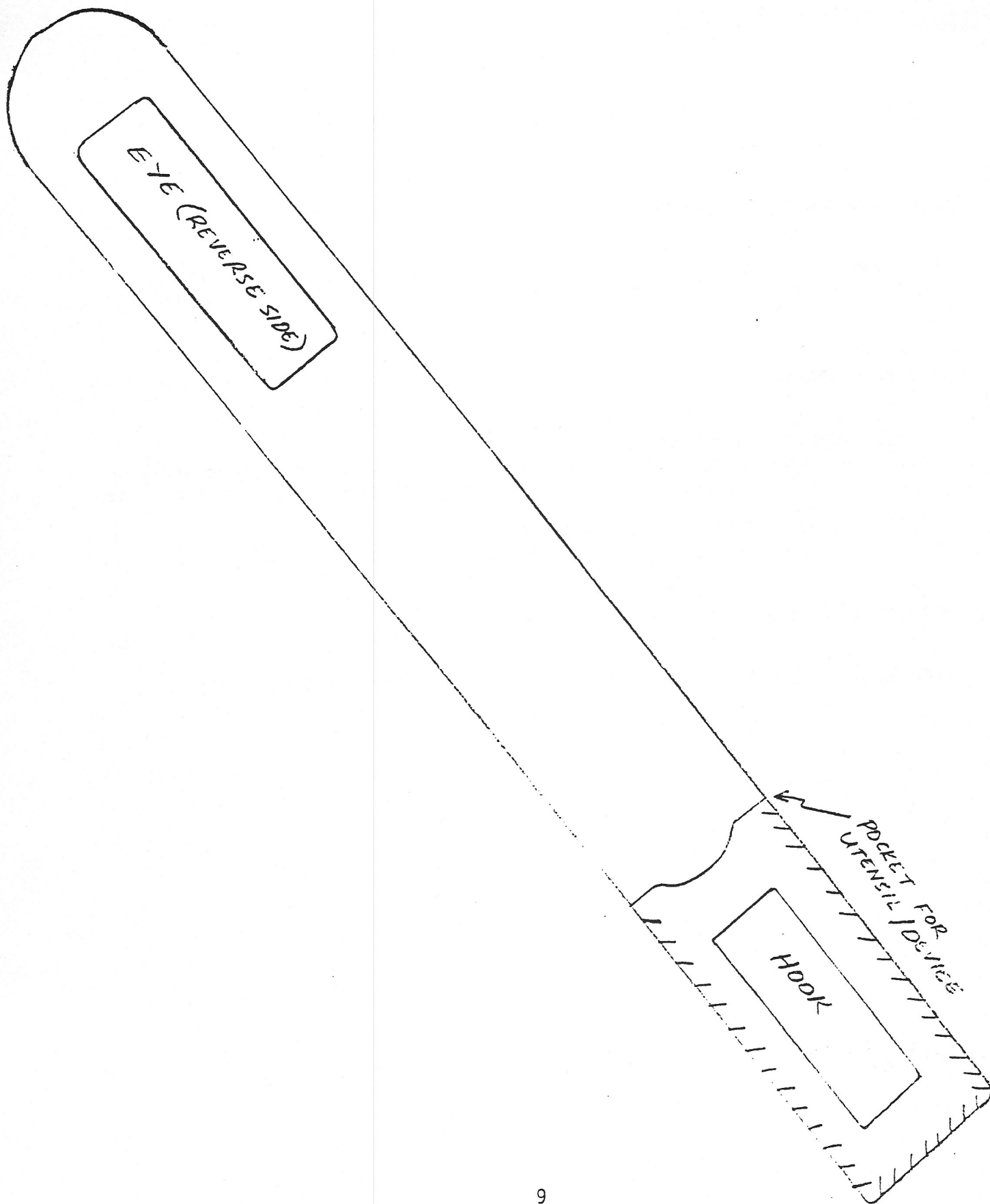
**Materials:** 2" Velcro or hook and eye, 2 strips of vinyl material ( 6"), 5 inches of 1/2" elastic strip, hot glue and glue gun, thread and needle.

**Construction/Design:**

1. Cut an 11" strip of vinyl.
2. Cut a 3" strip of vinyl.
3. Stitch the three sides of the shorter strip to the longer strip at the square end (see pattern). This becomes the pocket for the utensil.
4. Glue hook side of Velcro to top of pocket.
5. Glue eye side of Velcro to underside of left end of strip.

**Maintenance:** Wipe with damp cloth after use.

**Reference:** Preston; Fred Sammons, Inc.; Copeland, Ford, & Solon, 1976.



## Utensils with Built-up Handles

**Purpose:** To increase self-feeding skills.

**Suggested Uses:** Handles of devices such as toothbrushes and combs can also be built up to facilitate grasp.

**Material Options for Building Up Handles:** Handle bar grips, pipe insulation or splinting material, plastic resin, and scissors.

### **Construction/Design:**

Handle bar grips

1. Liquid plastic resin poured into handle of grip.
2. Stabilize utensil--making sure that ridges are in appropriate position in relation to spoon angle.
3. Allow to dry. (See directions on resin container.)

Pipe insulation (from plumbing supply)

1. Cut appropriate length of pipe insulation with scissors.
2. Insert handle of utensil into opening of pipe insulation.

Splinting material

Reference: See steps from Academic Training section (pencil grip).

**Maintenance:** Wash after use. Don't immerse splinting material in hot water such as water temperature of dishwasher.

**Reference:** Fred Sammons, Inc.; Preston.



## Adapted Utensil Handle - Dowel

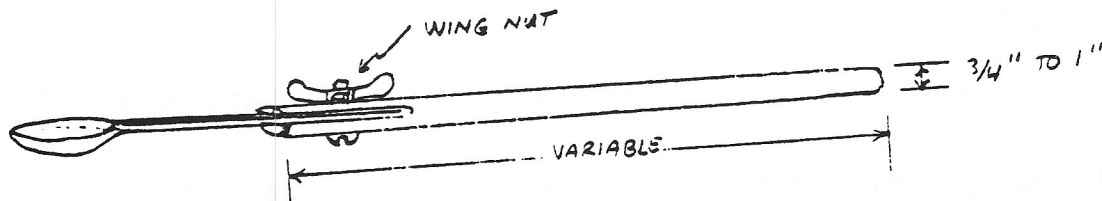
**Purpose:** To increase self-feeding independence for individual with limited range of motion.

**Suggested Uses:** Feeding during mealtime. Use a fairly flat-handled and rounded bowl spoon. Adjust angle of handle to fit individual needs. The same adaptation can be made for a toothbrush by drilling a hole through the handle if one does not exist. However, the angle of the toothbrush is difficult to adjust.

**Materials:** Spoon, dowel--cut to fit child's reach and grasp, wing nut, electric drill, and vise or clamp.

### **Construction/Design:**

1. Cut approximately a 2" slot into one end of the dowel.
2. Drill a hole midway through the cut.
3. Drill hole through the end of spoon handle.
4. Insert spoon into slot--tighten with wing nut.
5. Change the angle of the utensil by tightening and loosening the wing nut.



**Maintenance:** Wash after use.

**Reference:** Preston (also has swivel utensils); Copeland, Ford, & Solon, 1976.

**Caution:** Since use will be around child's face, end of screw should be either flush with wing nut or covered to avoid scratching the face.

### Adapted Utensil Handle with Ball

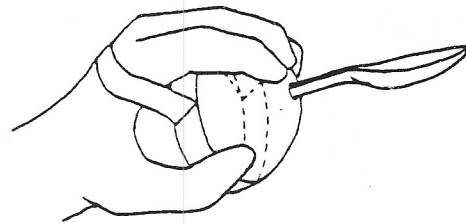
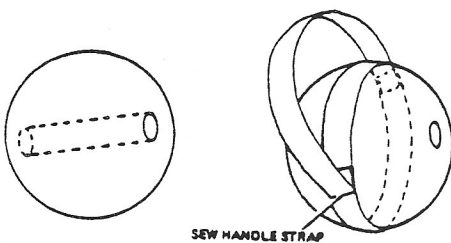
**Purpose:** To increase self-feeding skills for independence in use of utensils requiring grasp.

**Suggested Uses:** For use during feeding or other self-care utensil use for individuals with weak grasp.

**Materials:** Noncoated or painted rubber ball, size dependent on size of individuals hand; 1/4" to 1/2" wide elastic, length dependent on hand and ball size; vise; drill.

#### **Construction/Design:**

1. Place ball in vise.
2. Drill through center of ball, making the hole slightly smaller than the utensil handle.
3. Insert the utensil.
4. Attach optional elastic strap for individuals with weak grasp:
  - a. stretch elastic snugly around ball to determine length, cut to size, and hot-glue in place
  - b. to measure strap for hand, have the individual place his or her hand over the ball. Then place the strap around the hand to the first elastic. Leave an extra 1/4" on each end. Sew or glue ends of second strap to first strap.



**Maintenance:** Wash after use.

**Reference:** Copeland, Ford, & Solon, 1976.

### Cut Away Cup

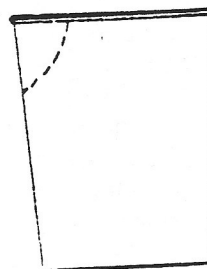
**Purpose:** To facilitate active engagement in the drinking process and to allow caregiver to see mouth area during drinking.

**Suggested Uses:** Drinking during meals or at any time.

**Materials:** Plastic beaker or plastic juice glass which is small enough to allow the individual to grasp--a slight rim will facilitate lip closure; cutting device (scissors and/or craft knife); emery board.

#### **Construction/Design:**

1. Cut area for nose.
2. Smooth rough edges with emery board.



**Cautions:** Begin to use with slightly thickened mixtures. Allow glass rim to rest on lips between sips to facilitate lip closure. Be sure to smooth edges of cut.

**Maintenance:** Wash after use.

**Reference:** Preston; Fred Sammons, Inc.

## One- and Two-Handled Cup Holders

**Purpose:** To enable individuals with limited grasp to hold onto a cup.

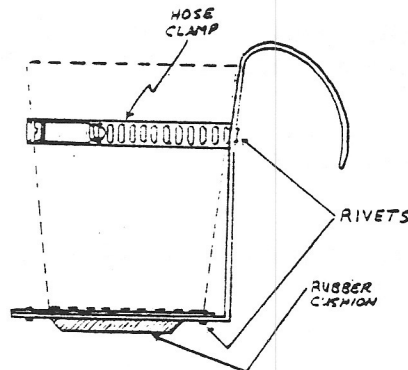
**Suggested Uses:** Plastic or paper cups can be set inside the ring whenever the individual is drinking. A two-handled variation helps bring hands into midline position.

**Materials:** Aluminum strip, 1" wide and 17" long; aluminum strip, 1" wide and 4 1/2" long, 1/8" thick; two rivets; rubber cushions, air hose clamp, size 40.

### **Construction/Design:**

1. Drill two holes in the 17" piece, one on the left end at approximately 2-1/4" from the end. The other hole is drilled 7" from the right end. The size of the hole is 9/64".
2. One hole is drilled in the 4-1/2" piece in the center. Size of hole is 9/64".
3. The air hose clamp is opened, and a hole 9/64" is drilled.
4. The 4-1/2" piece is laid on top of the 17" piece over the left hole (2-1/4"). These pieces are riveted (17" and 4 1/2") together by a countersunk rivet.
5. A bend is made approximately 6-1/2" from the right side. This will be the handle.
6. The air hose clamp is riveted to the hole on the right side.
7. A bend is made approximately 5-1/2" from the left end by lifting the aluminum up and out to establish platform for the bottom of the cup.
8. Rubber cushions are cemented on the bottom of the 4-1/2" piece at the two ends to further stabilize the holder.

**Note:** The length of the strip used for the one-handled cup can be extended to make a two-handled cup.



**Maintenance:** Wash after use.

**Reference:** Fred Sammons, Inc.; Copeland, Ford, Solon, 1976.

## Straws

**Purpose:** To increase independent drinking skills by using a polyester tube or disposable straw.

**Suggested Uses:** To increase lip control and to use with the individual who does not have enough motoric control to lift and hold a cup. Straw drinking can be shaped by beginning with a shorter straw length and gradually moving to a longer one.

**Materials:** A length of polyester tubing or a disposable straw can be used. The polyester tube can be bent with heat at the desired place. A plastic food container with a plastic snap-on lid can be used to hold the straw in place. Scissors to cut tubing.

### **Construction/Design:**

To adapt food container, such as a sturdy yogurt container:

1. Using an ice pick, scissor blade, or paper hole punch, punch hole in lid to accommodate straw.
2. Push straw through hole.
3. Place cover on container.



**Cautions:** Straw should rest on lips, rather than tongue to facilitate lip closure and appropriate sucking patterns. Do not use styrofoam cup.

**Maintenance:** Wash after use.

**Reference:** Fred Sammons, Inc. (bottle straw); Copeland, Ford, & Solon, 1976; Finnie, 1974.

## Plate Guard

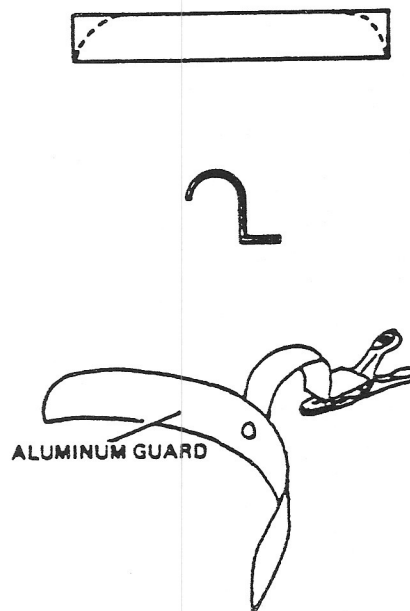
**Purpose:** To increase independent feeding skills.

**Suggested Uses:** Hook onto side of plate as a rail, which provides a rigid surface to scoop against. Scoop dishes and plastic and aluminum plate guards are commercially available at reasonable prices.

**Materials:** Aluminum strip 2" x 1/2", aluminum strip 6" x 1", rivets, board clip, hack saw, or may use rigid plastics.

### **Construction/Design:**

1. Round edges of longer aluminum strip with a hack saw.
2. File the edges smooth.
3. Curve the guard to match the curve of the intended plate to be used.
4. Crease one end of the small aluminum strip at 90°--about 1/4 of the total length from the end.
5. Curve the second end of the small aluminum strip. (See drawing.)
6. Drill a hole through the curved end of the small strip.
7. Drill a hole through the center of the longer strip.
8. Rivet the two pieces together.
9. Drill hole through clip and creased end of small strip. Rivet together.
10. The guard can now be attached to the plate.



**Cautions:** Some plastic plate guards do not hold up well in the dishwasher or microwave.

**Maintenance:** Wash after use.

**Reference:** Fred Sammons, Inc.; Preston; Copeland, Ford, & Solon, 1976.

## Commercial Food Preparation Devices

**Purpose:** To facilitate feeding by reducing the chewing effort needed to eat certain foods and to increase intake.

**Suggested Uses:** Various preparation devices can be used to reduce solid foods to semi-solids, permitting individuals with feeding difficulties access to an increased variety of fresh and nutritious foods.

**Cautions:** Most food preparation devices should be used by adults. Safety instructions are provided and should be strictly adhered to.

**Maintenance:** Dependent upon manufacturer's instructions.

**Other commercially available food preparation devices:** Hot plates, food processors, electric blenders, hand baby food grinders.

### **Reference:**

The Nurtury  
Teledyne Water Pik  
1730 East Prospect Street  
Fort Collins, CO 80521

This kit contains: food grinder, 3 texture disk blades to chop food to different consistencies, warmer and serving tray, spoons, and training tumbler.

Plastic hand food grinders -  
Gerber Company  
Available in most grocery and/or department stores.



## Nonslip Placemats

**Purpose:** To stabilize dishes during feeding.

**Suggested Uses:** Place non-slip material under place setting to make meal time more functional. May also be used with toys and leisure materials to keep them on table surface within reach.

**Material Options:** Dycem, damp towel (this can also be used in the bathtub to prevent slipping), Saran Wrap with scotch tape, suction cups or soap holders not glued on bottom of plate/bowl.

### **Construction/Design:**

Placemats may be individualized. For example, allergies, language stimulation activities or special feeding procedures can be listed directly on the placemat with permanent markers.

Cut nonslip material about 10" x 12" normally for placemat.

### **Maintenance:**

Dycem--wipe after use with wet washcloth.

Towel--can be laundered after use.

Plates with suction cups that are not glued on can be washed or put in dishwasher.

Redo instructions on placements with markers as they wear off.

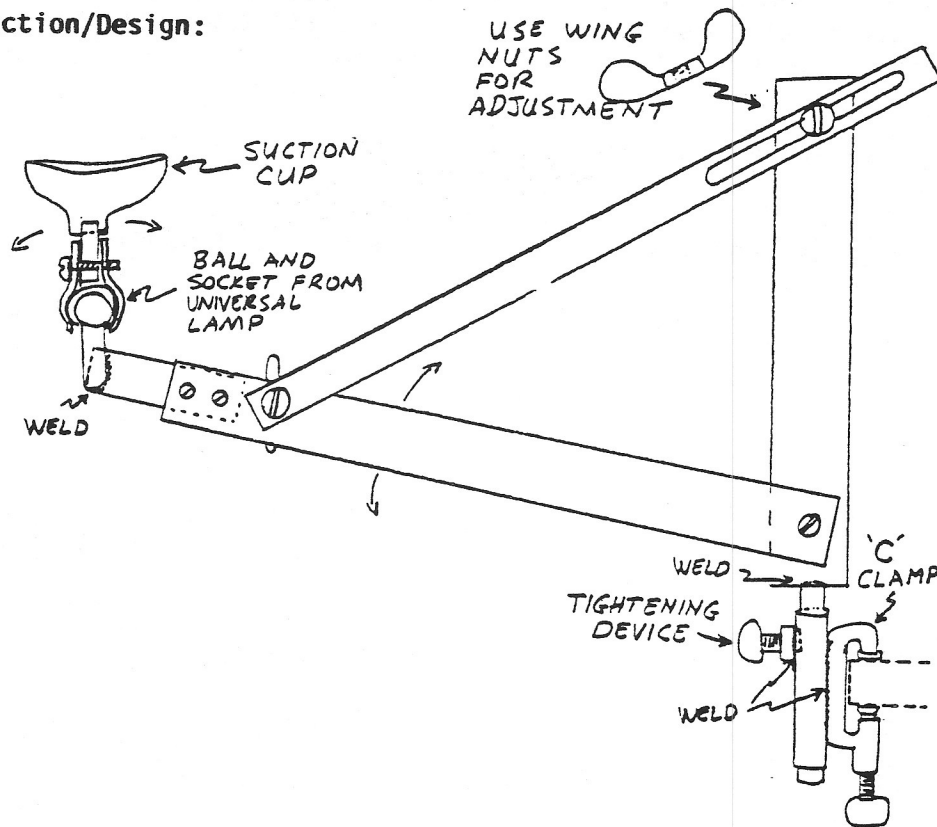
**References:** Fred Sammons, Inc.; Finnie, 1974.

## Plate Positioner

**Purpose:** Facilitates proper plate positioning and stabilization. Plate can be positioned at several levels and angled commensurate with individual needs.

**Suggested Uses:** The positioner can be attached to a table, desk, or lap board.

### **Construction/Design:**



**Cautions:** Be sure that there are no sharp edges or corners and that all surfaces are smooth. Check suction cup periodically to be certain that it is retaining its gripping power.

**Maintenance:** Clean regularly.

**Reference:** Adaptive Therapeutic Systems, Inc.

## Automatic Feeding Devices

**Purpose:** Enables individuals to feed themselves when they have limited use of their arms.

**Suggested Uses:** May be used during meals to maximize self-feeding.

**Cautions:** Select the least conspicuous device that allows maximum participation by the individual in the feeding process. Selection should be made in consultation with an occupational therapist who has knowledge of client's abilities. Demonstration and trial by user prior to buying the device is preferable.

**Maintenance:** According to manufacturer's directions.

**Reference:** Adaptive Therapeutics; Fred Sammons, Inc.; Preston.

## DRESSING

Dressing is often difficult for motorically impaired individuals. Some guidelines in clothing selection and adaptation can be used to increase the independence with which disabled children, adolescents, and adults can participate in the dressing process.

Clothing selected should be durable and made of easy care fabrics. Darkly colored materials generally show less staining; however, handicapped individuals should be allowed to participate as much as possible with color and style selection. Material texture needs to be examined. Rough materials should generally not be worn next to the skin, while smooth, slippery outer surfaces may make stable positioning difficult. Some of the newer insulator fabrics, such as Thinsulate, can be used in jackets and vests to give additional warmth in cold weather without the bulk of heavier insulation materials.

Clothing selected for wear by both disabled children and adults should be flame retardant. Children's ready made clothing is labeled according to whether it has been treated; however, adult clothing is not and this should be clarified at the time of purchase. Fabrics for homemade clothing are labeled if they are not flame retardant.

Severely handicapped individuals should practice dressing skills in natural contexts and across a variety of settings, caregivers, and clothing types. Children should practice skills with clothes while in the correct spatial placement; for example, to practice buttoning, one would practice when putting on one's own blouse, rather than practicing the skill with a doll. Dressing instruction should move from eliciting cooperation, such as

having an infant lift his or her legs during diapering, to assisting with dressing, and finally, to dressing independently. Physical prompting and/or graduated guidance is often more effective when provided from behind the individual. Part of dressing competence includes the daily selection of one's own clothing. Therefore, family members should make necessary adaptations to the physical environment, such as closets and drawers, to permit access to clothing.

Selection of clothing types and modifications is dependent upon the individual's balance, strength, range of motion, grasp, and reflex patterns, as well as his or her clothing preferences and vocation. In general, it is best to select the modification that matches typical articles worn by nonhandicapped peers, but which is commensurate with the individual's current motoric abilities. For example, Velcro button replacements are very easy to manipulate, but snap grippers may be more typical among other members of the nonhandicapped population and thus more appropriate.

## Button Hook

**Purpose:** To permit individuals who lack the fine motor skills necessary for buttoning to button clothes independently.

**Suggested Use:** The button hook is grasped and poked through the button hole, hooked onto the button, and then pulled back through the button hole.

**Materials:** Splinting material for handle, paper clip for hook, or similar wire bent to form hook.

### **Construction/Design:**

1. Heat splinting material according to manufacturer's directions.  
(See Academic section: Pencil grip.)
2. Shape splinting material into desired handle type.
3. Bend paper clip or wire into hook shape.
4. Shape splinting material around wire.



**Cautions:** Button hook needs to be used away from face.

**Maintenance:** Check periodically to be certain wire hook has not worked loose. Remold or glue for stability if this occurs.

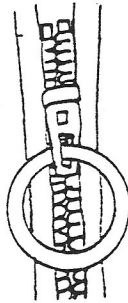
**Reference:** Fred Sammons, Inc.

## Zipper Ring

**Purpose:** To enlarge a zipper pull for those who lack the fine motor control to grasp and manipulate standard zipper pulls.

**Suggested Use:** To attach to zipper pulls on any type of clothing, e.g., jackets, sweatshirts, or accessory where zippers are used as closings, e.g., gym bag.

**Material:** A variety of materials, such as plastic curtain rings, ribbons, yarn strings, key chains, and ornamental zipper rings (available in fabric stores), can be used to provide this modification. Be certain material used is age-appropriate and attractive as well as functional.



**Maintenance:** Most of these materials can be easily removed prior to washing.

**Reference:** Fred Sammons, Inc. also supplies a long-reach zipper pull for hard to reach zippers such as those on the backs of dresses.

## Velcro Replacements for Buttons and Zippers

**Purpose:** To permit individuals who lack the fine motor skills to have increased independence in buttoning and zipping.

**Suggested Use:** To replace zippers and buttons in a variety of clothing.

**Materials:** Velcro--size dependent upon size of button or zipper being replaced, sewing thread, sewing needle, scissors.

### **Construction:**

#### To replace buttons:

1. Remove buttons from clothing.
2. Stitch button holes closed.
3. Resew buttons over the button holes.
4. Attach Velcro pieces under button hole and where the original button was located.

#### To replace zippers:

1. Remove zipper.
2. Replace with an equal length of Velcro.

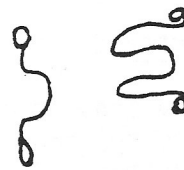
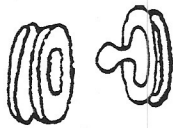
**Maintenance:** Follow washing instructions. A small brush may be used periodically to remove lint and threads that become caught in the Velcro.



## Alternative Fasteners

**Purpose:** To permit individuals who lack fine motor skills alternate methods for fastening their clothing. Gripper snaps and metal hooks and eyes can be used to replace other fasteners such as small buttons that are more difficult to manipulate.

**Suggested Use:** These fasteners may be more socially acceptable than Velcro replacements and therefore should be considered for individuals who are able to manipulate them. Fabric stores will often attach gripper snaps or let customers use the tool for free or a minimal charge. Both items are available in several sizes.



**Materials:** Gripper fasteners, metal hook and eye, needle, thread.

**Maintenance:** When these fasteners are securely attached to clothing, they may be washed according to the washing instructions on each specific article of clothing.

## Velcro Seams

**Purpose:** To permit an individual to easily get into or out of any garment. Inside seams may be replaced with Velcro.

**Suggested Use:** To replace seams of any garment.

**Materials:** Velcro--length determined by length of seam.

**Procedure:**

1. Remove stitching from seams.
2. Replace stitching with 2 lengths of Velcro (one piece for each side of the seam, one hook piece and one eye piece of Velcro).

**Cautions:** Using of variation may make pants pucker and they won't hang as well and therefore may not be appropriate for older children and adults.

**Maintenance:** Velcro is machine washable.

**Variation:**

1. Replaced seams also make wearing pants a more feasible option for those individuals with leg braces or casts.
2. For the younger child, it may be less expensive to use small circles of Velcro at intervals like snaps, rather than using two long strips.

## Sock Aid

**Purpose:** To increase independence in dressing for those individuals who may have limitations in strength and/or mobility.

**Suggested Use:** Can be used with all types of socks.

**Materials:** 1-quart plastic bleach bottle (empty), scissors, hole punch, vinyl or plastic-coated clothesline (two 12" pieces), emery board.

### **Construction/Design:**

1. Using the scissors, cut the plastic bottle in half (down the length of one side, through the bottom, and up the length of the other side).
2. Discard one-half of bottle.
3. With a hole punch, punch a hold in each of the upper corners of the cutout (2).
4. Insert one length of clothesline into a corner hole and knot the ends together, forming a loop. This is one handle. Repeat with second length of clothesline in other corner of the cutout plastic bottle.
5. Using the scissors, cut off the bottom end of the bottle and round the edge. Smooth with the emery board.
6. The sock is placed over the sock aid. The U shape of the half bottle should provide a space into which the client can slip his/her foot. Then the sock aid can be removed by pulling up on the handles.

**Maintenance:** Can be rinsed down for cleaning. Watch for sharp edges that may snag socks or injure person.

## Considerations in Clothing Selection

**Purpose:** Clothing should be selected to increase independence in dressing and ease caretaker responsibilities.

**Bibs:** Bibs can be worn by the younger child. A terrycloth material with waterproof backing will protect the child's outer clothing. It may be more appropriate for an older individual to wear an apron.

**Coats:** Ponchos and capes are sometimes easier to get on/off than coats. A sleeveless down vest can be worn under an outer coat for added warmth.

**Gloves:** Mittens are usually easier than gloves to put on and take off.

**Pants:** Elastic top bands or Velcro fly replacement for individuals who are unable to zip, snap, button. Double material for areas that receive more wear, e.g., knees and seat.

**Shirts:** V or scooped-neck to provide ample room when putting on over head. Dolman or raglan sleeves are desirable because the width at sleeve allows caretaker to reach up sleeve when assisting with dressing.

**Shoes:** Both feet should be measured since there are often size differences. Shoes should be relatively easy to put on and take off. Therapists or cobblers can often reinforce shoe areas that tend to wear quickly. Be sure to examine the feet for red, raw, or blistered areas. Shoe lace variations, such as Know Bows, elastic shoe laces, and extended shoe horns, are available commercially.

**Smocks:** The older child can wear a smock during activities such as eating and painting. A pocket around the bottom can be made to catch falling food. A smock can also be worn by the caretaker during feeding to protect clothing.

**Socks:** Tube socks are easier than regular socks for many individuals to put on, since they don't require matching the heel of the foot to the heel of the sock. A variety of sock assists are available commercially.

**References:** Functional Fashions Program; Finnie, 1974; Hotte, 1979; Preston; Fred Sammons, Inc.

## HYGIENE

The importance of good hygiene to social acceptability is apparent, and many individuals with handicaps experience frequent illnesses, making good hygiene even more important. This section offers suggestions on how to facilitate independence in hygiene with persons who have handicaps. Included are dental, bathing, and grooming adaptations.

Selection of equipment in this area should be carefully considered to insure safety, durability, client need, and age-appropriateness.

Healthy gums and teeth can be achieved through a variety of ways, such as adapting toothbrush handles, providing battery-operated toothbrushes, or by using toothettes. Regular checkups by a dentist who is both trained in and sensitive to the needs of handicapped individuals is imperative.

Several positioning devices for use during bathing can do much to decrease caregiver demands while increasing safety and self-sufficiency. Other devices such as soap mitts and alternatives such as soap on a string or pump soap provide a range of adaptations to meet individual requirements.

Adapted nail brushes, adapted or long handled brushes, combs, and sponges for bathing are readily available and reasonably priced. Many of these devices are also easily constructed.

### Bathing Devices for Positioning

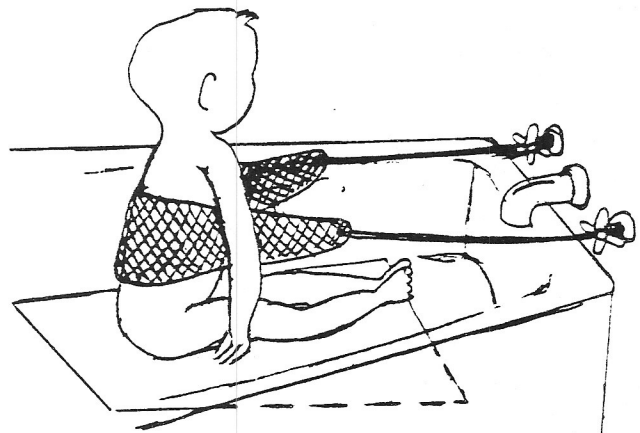
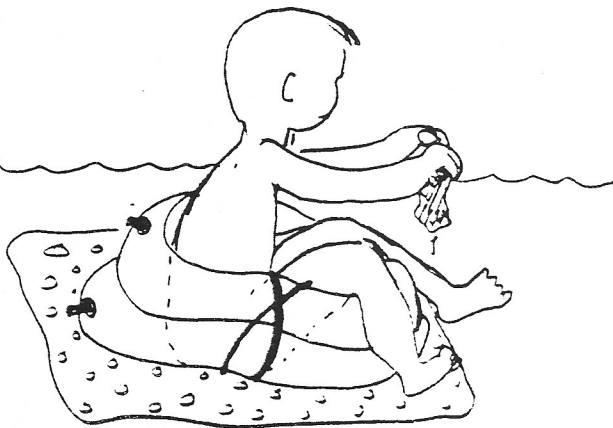
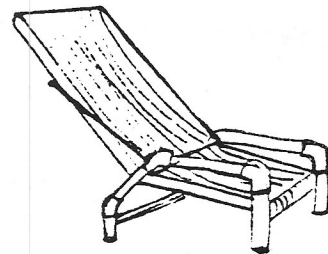
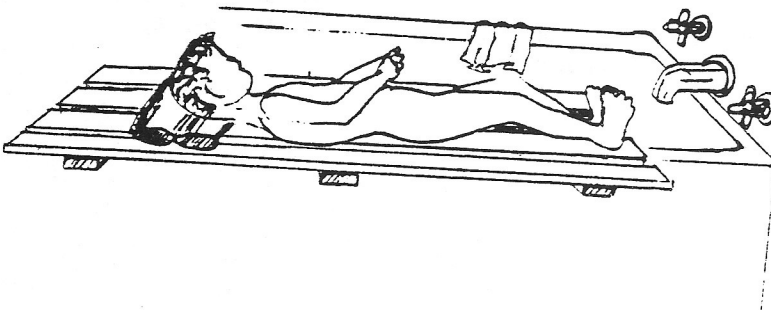
**Purpose:** To increase independence in bathing by promoting postural and safety, thus easing the responsibilities of the caregiver.

**Suggested Uses:** Assistive devices may be used in the tub or sink. For a young child, larger containers may be placed on sturdy tables to allow the caregiver to work at a more suitable height. Several types of seats can be found at department stores or purchased through commercial suppliers.

**Cautions:** Never leave child alone in tub.

**Maintenance:** Keep device clean with vinegar/water solution to cut soap scum and hard water marks.

**Reference:** Finnie, 1974; Ortho-Kinetics; Everest & Jennings (the Parker Chair).



## Handrails and Other Support Devices

**Purpose:** To increase independence in bathing and toileting.

**Suggested Uses:** Can be put on walls to the sides of the toilet. Can be attached to walls near tub or shower or clamped to the side of the tub or shower to aid in self-transfer. Portable rail frames may also be constructed for individual children.

### **Construction/Design:**

Handrails are usually made of steel which may or may not be covered with a coating such as nylon. Handrails should be positioned at the best angle of pull, usually 45°-90° of elbow flexion. Rails may be placed on the wall next to tubs and/or toilets. Bathtub safety rails that can be clamped to the side of a tub are commercially available. Rails can usually be secured with studs or brackets.

**Cautions:** Clients should never be left alone in tub or shower. Be sure that all surfaces/corners are smooth and that rails are securely attached.

**Maintenance:** Check periodically to ensure that rails are secure. Keep devices clean with vinegar/water solution to cut soap scum and hard water marks that may make surface slippery.

**Reference:** Finnie, 1974; Fred Sammons, Inc.; Abbey.

### Non-Slip Tub Mats

**Purpose:** To help stabilize the individual's body during bathing. If the individual lays on a nonslip mat, the tub should be filled with water only up to the individual's ears (about 1").

**Materials:**

Suggested options:

1. Terrycloth towel placed in bottom of tub.
2. Bath mat with suction cups.
3. Self-adhering, rubberized strips can be placed in tub and on tub rim.
4. Dycem.
5. Commercial non-skid mats.

**Cautions:** Never leave person alone in tub or in bathing device.

**Maintenance:** Wash after use. Inspect to be certain gripping quality has not been reduced.

**Reference:** Fred Sammons, Inc.



## Bath Mitt

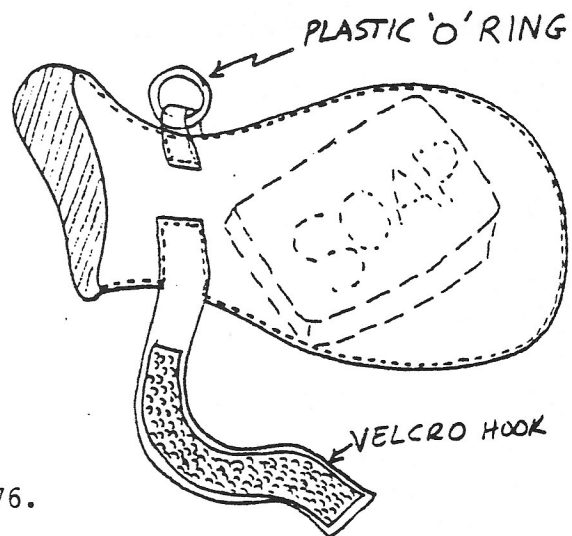
**Purpose:** To permit individuals with reduced hand function to lather and wash themselves when bathing or showering.

**Suggested Uses:** Use during bathing or showering. Soap may be inserted into the mitt to allow for continuous lathering.

**Materials:** Terrycloth material for mitt; a strip of soft, sturdy fabric such as poplin duck; strip of Velcro hook; "O" ring.

### **Construction/Design:**

1. Make pattern by drawing around hand 1" larger than hand.
2. Cut mitt out of three thicknesses of terrycloth.
3. Hem bottoms of all three pieces of cloth.
4. Sew all three pieces of terrycloth together, matching hems.
5. Turn mitt right side out.
6. Attach Velcro hook to strip of fabric.
7. Sew one end of this strip into mitt seam at wrist.
7. Attach "O" ring to 2" strip of fabric. The other end of this strip of fabric should be sewn into other mitt side seam at wrist.



**Maintenance:** Machine washable.

**Reference:** Copeland, Ford, & Solon, 1976.

### Nail Brush with Suction Cups

**Purpose:** To permit independence in nail cleaning for the individual who is unable to bring two hands together to midline or only has use of one hand.

**Suggested Uses:** Secure to side of sink or bathtub during washing/bathing.

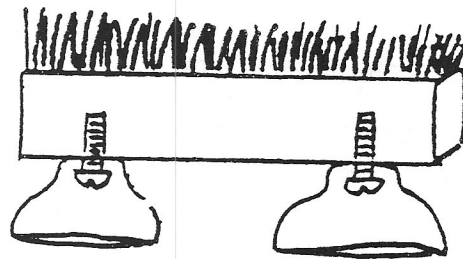
**Materials:** Nail brush, 2 small suction cups, glue or 2 screws, hot glue gun.

**Construction/Design:**

Glue or screw the suction cups to the bottom of the nail brush.

**Maintenance:** Wash periodically.

**Reference:** Robinault, 1973.



## Optional Dental Care Devices

**Purpose:** To maintain healthy gums, teeth, and breath.

### **Suggested Alternatives Matched to User Characteristics:**

Battery-operated toothbrush - The large handle may be used more easily by persons with a less refined grasp. Toothbrush motion gives tooth/ gum stimulation for persons with limited hand control.

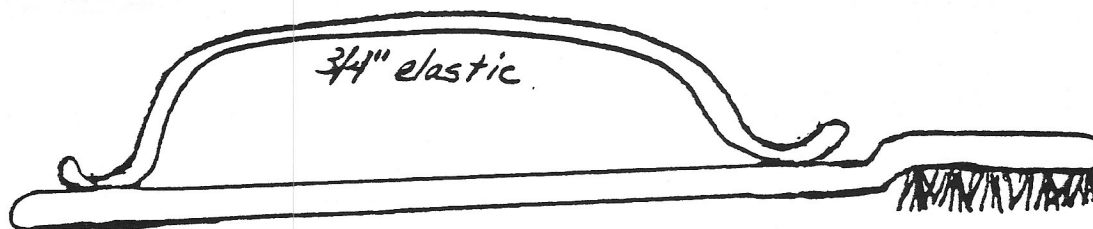
Toothbrush with built-up handle - Handle may be molded to accommodate a variety of grasp patterns (see Feeding section for utensils with built-up handles and/or Academic section for orthoplast pencil grasp).

Washcloth or flannel material - May be wrapped around caregiver's finger and used to wash and stimulate gums and teeth.

Toothettes - These are disposable devices with a sponge-like brush that is impregnated with dentifrice and used to stimulate gums and freshen breath. These may be ordered from Halbrand.

Mouth spray - To cleanse mouth and freshen breath. Helpful for mouth breathers who lack free saliva flow.

Toothbrush with elastic band or quad quip holder - May be used with individuals unable to maintain grasp on toothbrush handle.



**Cautions:** Start with a small amount of toothpaste, remembering that is the stimulation, not the toothpaste itself, which keeps gums and teeth healthy.

**Maintenance:** Be sure to keep the utensil and holder clean and stored in a clean, dry place.

## TOILETING

The achievement of independent toileting is a major milestone for normal children as well as handicapped children, adolescents, and adults. Bailey and Wolery (1984) offer several guidelines for toilet training. These include:

- Daytime toileting should be trained prior to nighttime toileting.
- Bladder control should be trained prior to bowel control.
- Males should be trained first in a sitting, rather than a standing, position.
- Individuals should be trained to indicate the need to use the toilet only after they are using the bathroom consistently.

Bailey and Wolery (1984) also suggest that prior to initiation of training, the following criteria should be met:

- Caregivers must be willing to participate in the training process.
- Individuals to be trained must be free from medical problems that affect bowel/bladder control.
- Individuals to be trained must demonstrate compliance in tasks such as following simple directions.
- Bladder control must be demonstrated by staying dry for periods of approximately 1-1/2 to 2 hours.

Several toilet training programs have been developed (Foxy & Azrin, 1974; Fredericks et al., 1975). Alarm systems may be used increase the effectiveness of a training program. Instructions for their design are included in this section. Adaptive toilets can be made or purchased which can increase balance during toileting. Generally, when seated, the

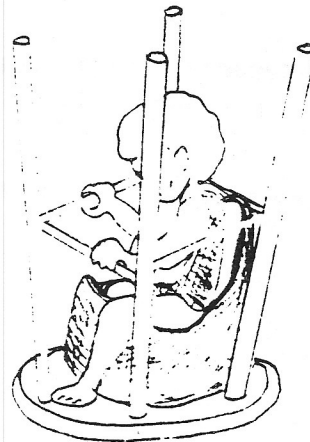
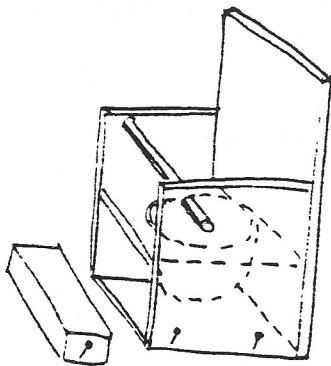
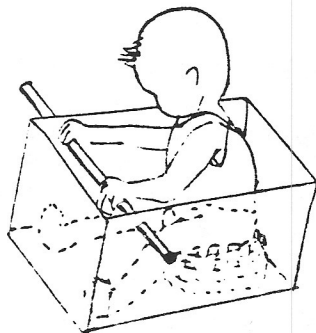
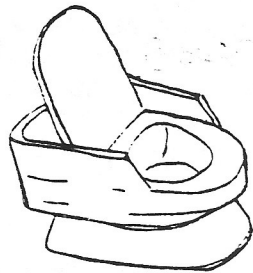
individual should be in a relaxed position, with hips and knees flexed, and with feet resting on a flat surface. Head and trunk control, as well as balance, are required in order for individuals to sit alone (Finnie, 1974). Several types of pants protectors are available for individuals who experience incontinence or for whom disposable diapers are inadequate.

## Adaptive Toilets for the Young Child

**Purpose:** To increase support and balance during toileting.

**Suggested Uses:** Use for initial and ongoing toileting needs. See diagrams for suggestions.

**Materials:** Cardboard, box, wood, vinyl cylinders.



**Cautions:** Provide a wide, solid base for safety, back support, and comfort and a seat belt to keep child on seat.

**Maintenance:** Keep clean by washing with disinfecting cleaner after use. Be certain joints are secure and tight.

**Reference:** Finnie, 1974.

## Adaptive Toilet Seat for Standard Toilet

**Purpose:** To increase independent toileting skills.

**Suggested Uses:** Attach to regular toilet for users with small buttocks or who cannot maintain balance on regular open seat.

**Materials:** Plastic splinting material or flat, solid, heavyweight 1/4" vinyl sheet that will support user's weight.

### **Construction/Design:**

Cut piece with hole in center to fit a flat surface directly under the existing toilet seat to decrease the size of the hole in the regular seat and to support the individual's buttocks. Drill two holes to the back of the "new" seat to attach with bolts that hold the regular toilet seat in place. Walker, rails, belt, or some type of restraint may be used to keep individual on toilet.

**Cautions:** Never leave individual on toilet unsupervised or without support if he/she has difficulty balancing.

**Maintenance:** Keep clean. Wash after use. Be certain it is attached securely and bolts do not work loose and cause slipping.

**Reference:** Fred Sammons, Inc.; Abbey; Childsafe; Preston.

## Changing Table for Infants and Young Children

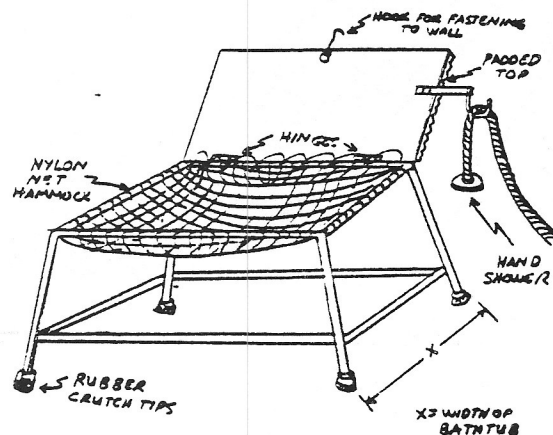
**Purpose:** To make changing diapers and clean-up and hygiene of incontinent and encopretic individuals easier.

**Suggested Uses:** Table fits into bathtub and is at height-appropriate for adult caregiver.

**Materials:** Frame with nylon mesh hammock lash-tied with nylon or polyester rope to frame and hand-held shower attached to shower unit or faucet in tub, hinged hard-surface top (may be formica-covered).

### **Construction/Design:**

1. Make frame of wood or heavy PVC piping. Use elbow joints with PVC to create corners.
2. Lash-tie mesh for hammock to frame.
3. Drill holes in hard surface top.
4. Lash-tie hard surface top to length of upper back piece of frame.
5. Place hook on hard surface top to hold top against wall when using the hammock.
6. Place wide rubber crutch tips on all four legs.
7. Optional: Attach hook to side of hard surface top



**Cautions:** Never leave child unsupervised on changing table.

**Maintenance:** Wash after each use.



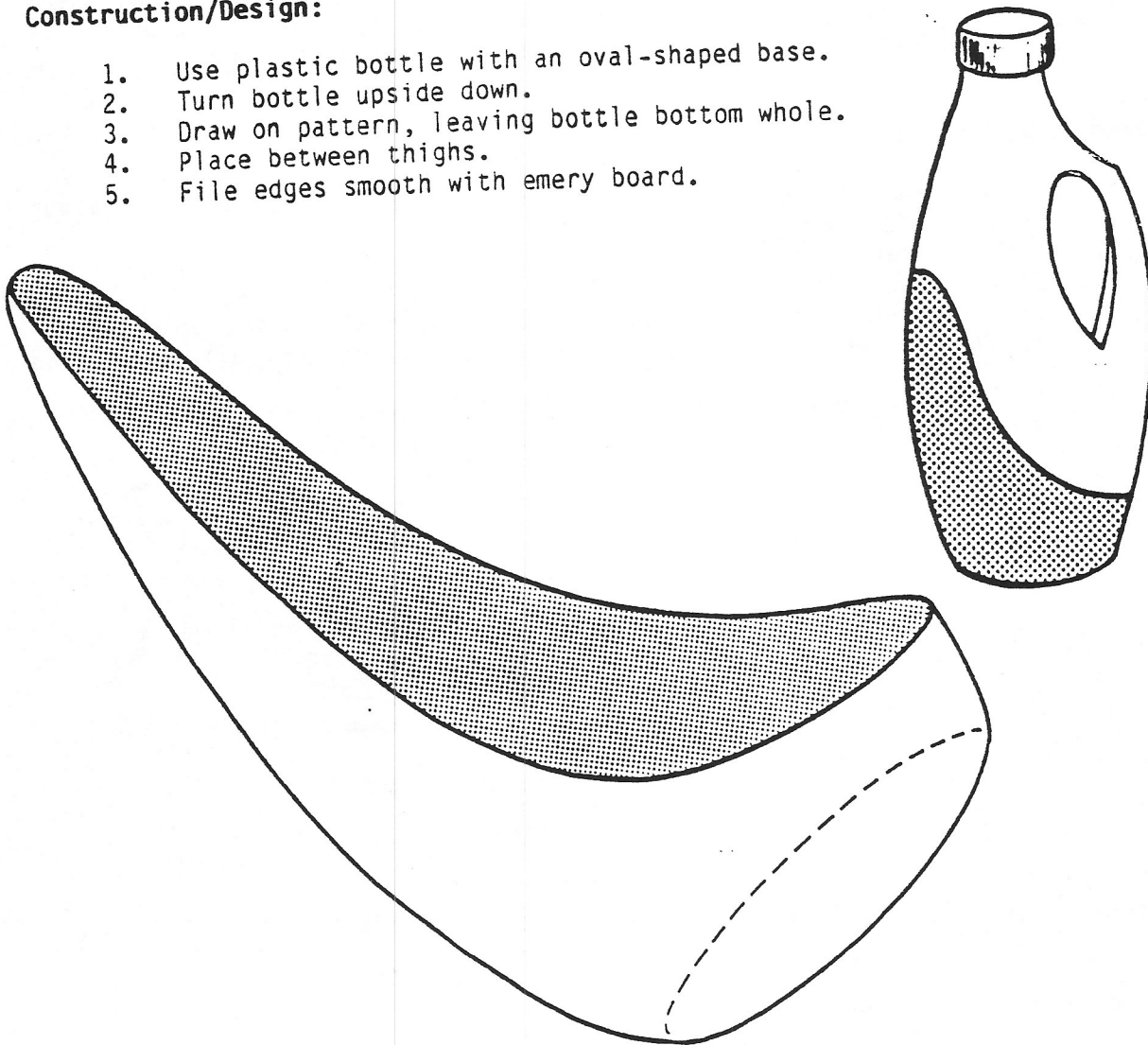
## Male Urine Deflector

**Purpose:** To deflect urine spray when males are urinating in a sitting position on toilet or potty chair.

**Materials:** Plastic bottle, as shown in pattern, with an oval-shaped base; cutting device; emery board.

### **Construction/Design:**

1. Use plastic bottle with an oval-shaped base.
2. Turn bottle upside down.
3. Draw on pattern, leaving bottle bottom whole.
4. Place between thighs.
5. File edges smooth with emery board.



**Cautions:** Do not fasten to potty chair or toilet. Be sure that edges are filed smoothly.

**Maintenance:** Can be sterilized.

### Wet Pants Signaler

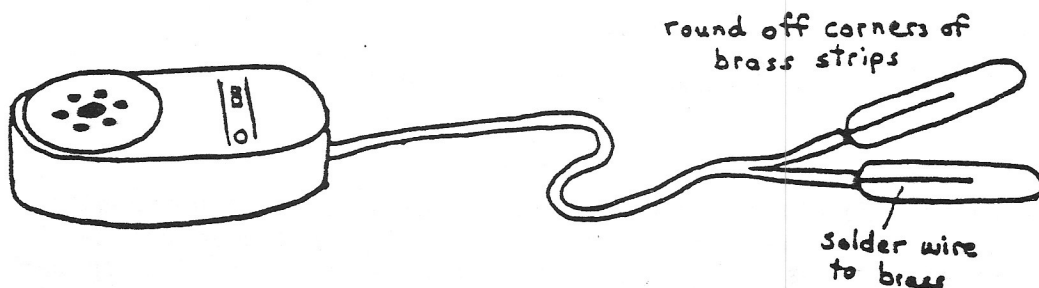
**Purpose:** The device is taped to the individual's diaper or underwear which activates a buzzer when the individual urinates.

**Suggested Use:** For use during toilet training: permits accurate baseline measurement and allows implementation of immediate correctional reinforcement procedures.

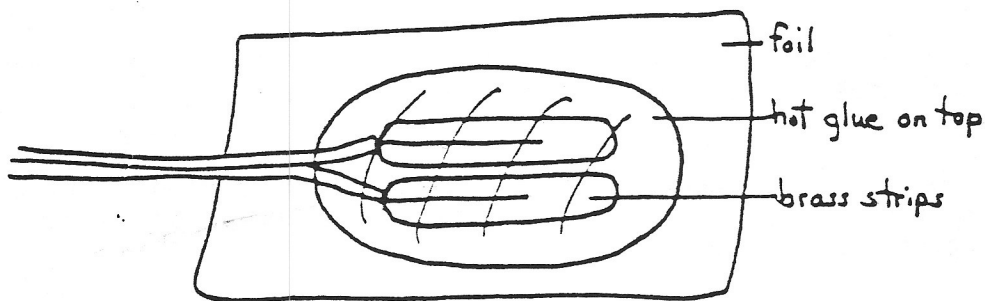
**Materials:** "Safe House Water Alarm" by Radio Shack or other similar, battery-operated flood alert device, masking tape, 2 strips of brass or copper about 1/4" x 1-1/2", hot glue with glue gun, rosin core solder, soldering iron, piece of aluminum foil, rubber cement glue, board to work on.

#### **Construction:**

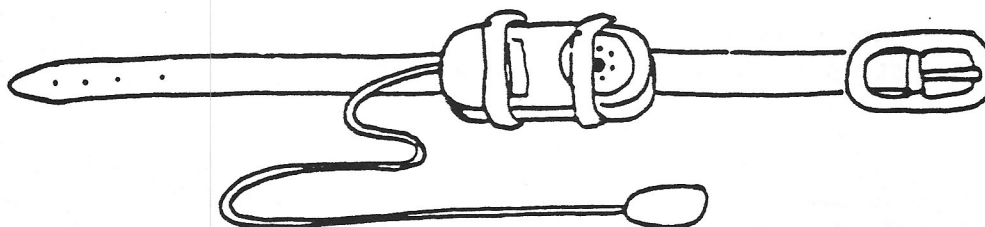
1. Cut the wire that comes out of the bottom of the alarm to about 3' or a comfortable length that will reach from the individual's waist to the correct position in the underwear. You may want to make it a little longer to allow for pants to be pulled up and down easily. You can always coil up the extra wire and fasten it with a rubber band when it isn't needed.
2. Strip about 1" of plastic off the ends of this wire and solder a strip of brass to each wire. See diagram below. Round off the corner of the brass strips.



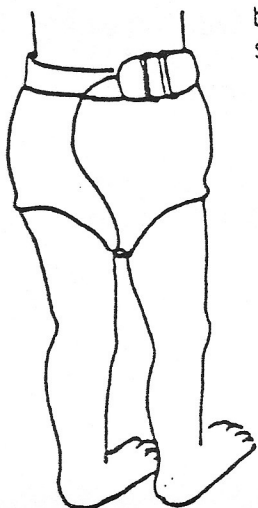
3. Using rubber cement, glue a piece of aluminum foil to a board. Then glue the 2 brass strips, soldered side up, about 1/8" apart on the foil. This will prevent the hot glue from covering the bottom side of the brass strips.
4. Cover the brass strips and the wire with hot glue. Allow the glue to spread about 1/4" around all sides of the strips. See diagram below.

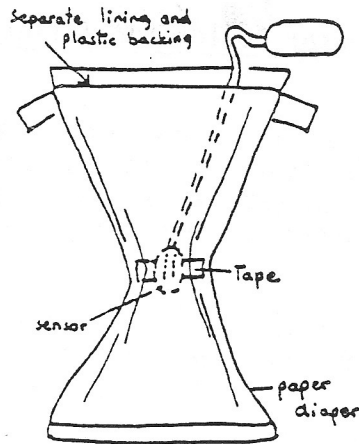


5. When the glue is cool, pull it gently off the foil. It shouldn't have stuck to the foil very much. Peel off any foil that stuck and rub off the rubber cement that is left on the brass strips. This "modified sensor" will now turn on the buzzer when the two brass strips come in contact with wetness.
6. To soften the sound of the buzzer, open the alarm and put a piece of tape over the center hole of the buzzer. You can also wrap foam rubber around the outside of the alarm and tape it in place.
7. Use 2 wide rubber bands to fasten the alarm to a belt. See diagram below.



8. Fasten the alarm around the individual's waist with the belt. Allow the wire to run outside the individual's underwear and tape the sensor to the outside of their underwear between his or her legs. For a boy, you may want it slightly forward. Tape it so that the brass strips are against the underwear. See diagram below. Set the switch to the "alarm" position.





**Note:** The sensor can also be used with disposable diapers. Separate one end of the lining from the plastic outer layer. Slip the sensor between these two layers and tape it against the soft lining as you would the underwear with the brass facing in. The wire will come out the top of the diaper and the diaper can be worn as usual. Fasten the alarm to the individual's waist. See above diagram.

This device should be used in a specific toilet training routine as described in recent books and journal articles on toilet training handicapped learners. The buzzer may serve to alert the individual and caretaker that an accident is taking place and then the appropriate correction procedure may be used. Sometimes the buzzer will stop the individual and they can go to a toilet to finish urinating in an appropriate place.

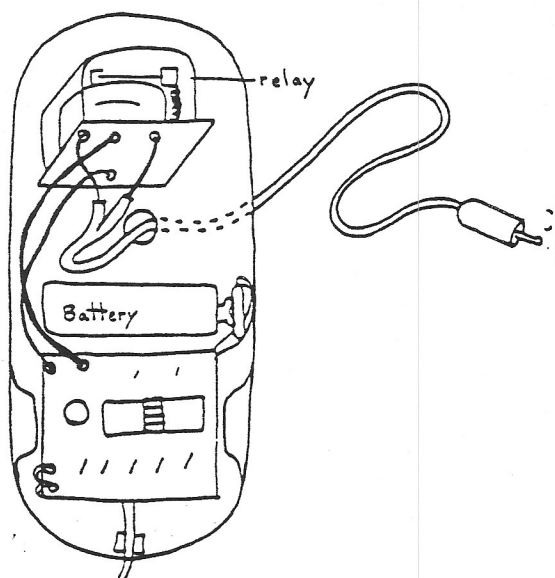
The device can also be used to gather baseline data to figure out an individual's normal schedule of urinating before initiating a toilet training program. In this case, it is suggested that the sound of the buzzer be muffled with foam rubber so as not to upset the individual.

**Caution:** Do not allow the individual to put the sensor in his or her mouth. Use with caution for individuals who have seizures. Consult a physician before using with any individual who has serious health problems, especially heart problems. Do not use with individuals who are using any type of electronic device for medical purposes.

**Reference:** Burkhart, 1980; Sears (pants alarm, urine alarm for night use); Azrin & Foxx, 1974; Koegel, Dunlap, & Koegel, 1974; Fredericks, Baldwin, & Grove, 1975.

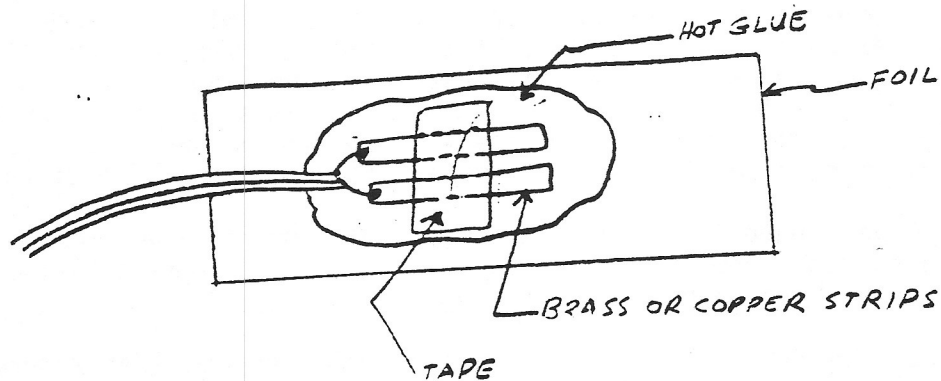
5. Split and strip both ends of the 5' wire and solder the subminiature size plug to one end.
6. Push the other end of the 5' wire through the screw hole where the buzzer was attached, leaving the end with the plug outside. Twist together and solder one conductor of this wire to wire "C" of the relay as in diagram above. Note: This is the "common" wire of the relay. Twist together and solder the other conductor to wire "A" of the relay as in diagram above. Note: This is the "normally open" wire of the relay. Tape the wire to the inside of the back of the alarm case so that it will not put stress on the connection.
7. Tape around all connections so that none of the wires will touch each other when the cover is replaced. The relay will fit sideways where the buzzer was. See diagram below.

Test to see if the relay clicks on when you wet the "remote sensor" attached to the end of the wire coming out the bottom of the alarm. Alarm switch should be in "alarm" position.



8. To make the "remote sensor" more usable for the potty, cut off the wire about 4' long or whatever manageable length you like. split and strip the ends of this wire and solder one strip of brass or

copper to each wire. Tape these 2 strips about 1/8" apart on a piece of foil. Put the tape across the middle of the strips, not the ends. Then place a glob of hot glue on each end to hold them in place. When cool, remove the tape and foil. Peel off any foil that might have stuck to the glue. See diagram below.



**Cautions:** Never leave individual with balance or seizure problems unsupervised.

**Reference:** Burkhart, 1980.

### Commercially Available Pants Protectors

**Purpose:** To protect outer clothing in the event of incontinence.

**Suggested Use:** To wear underneath clothing for those who are not toilet trained or who experience incontinence and when regular disposable diapers are not large or absorbent enough.

#### **Commercial References:**

Attends - Proctor and Gamble  
Disposable briefs and/or diapers  
small, medium, extra large size

Also available in drug stores.

DRI Pride - Gerber Health Products  
Snap on pant with  
disposable pad  
Adult and children's sizes

Also available in drug stores.

## Homemade Pants Protector

**Purpose:** To protect outer clothing in the event of incontinence.

**Suggested Uses:** To wear underneath clothing for those who are not toilet trained or who experience incontinence.

**Materials:** Muslin, broadcloth, or other sturdy fabrics that are washable and absorbent, gripper tape or Velcro for closure.

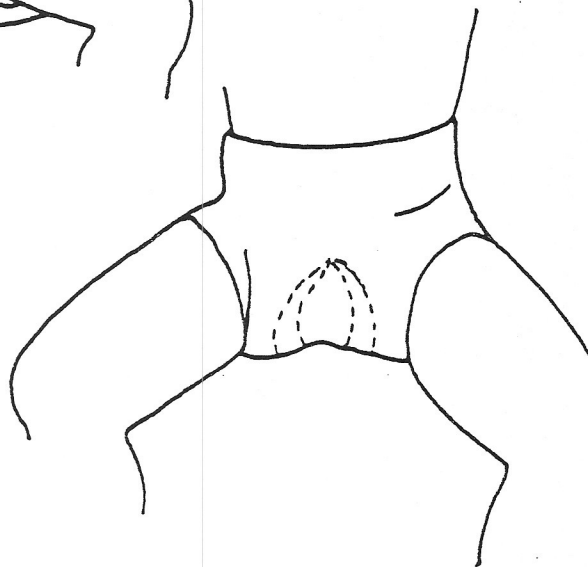
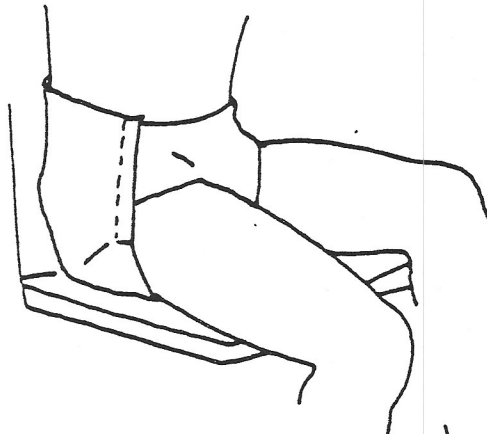
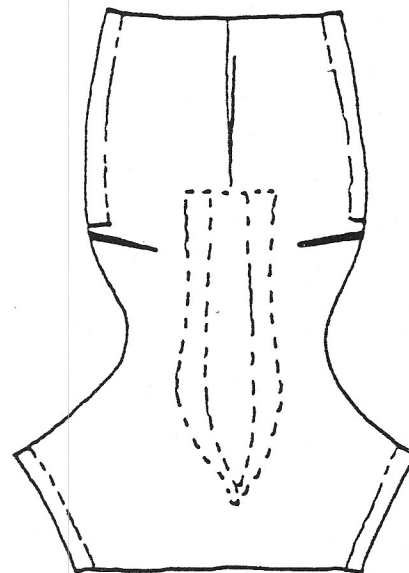
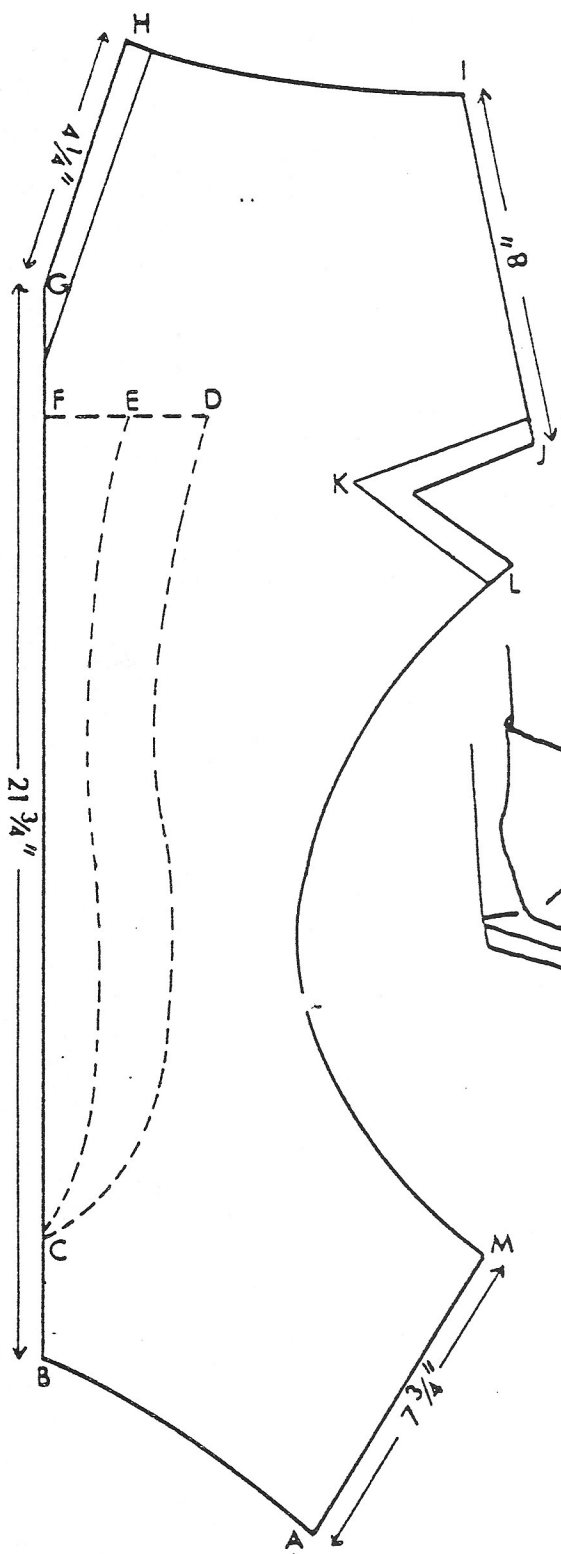
### **Directions:**

1. Fold material lengthwise with points B, C, F, and G on fold. Points A, M, and K are each 6 inches from fold. Cut two of pattern. Use leftover scraps of fabric for padding in dotted areas C, D, E, and F.
2. Sew darts GH and JKL.
3. Baste padding to one of the pieces of cut pattern, as indicated at CDEF.
4. With 1/4 inch seam, join the two pieces of material cut to pattern, leaving a 4 inch opening for turning right side out.
5. Stitch padding, which has now been turned to the inside, firmly in place through both pieces of fabric.
6. Stitch 4 inch opening together.
7. Sew gripper or Velcro tape to each edge, AN and IJ, so as to ensure closure at sides with comfortable fit for leg openings.

**Note:** For male wearers, extra protection can be obtained by inserting the penis and scrotum into a shower cap which has been stuffed with cotton. Be sure to extend thin layers of cotton over the edge of this container to prevent chafing.

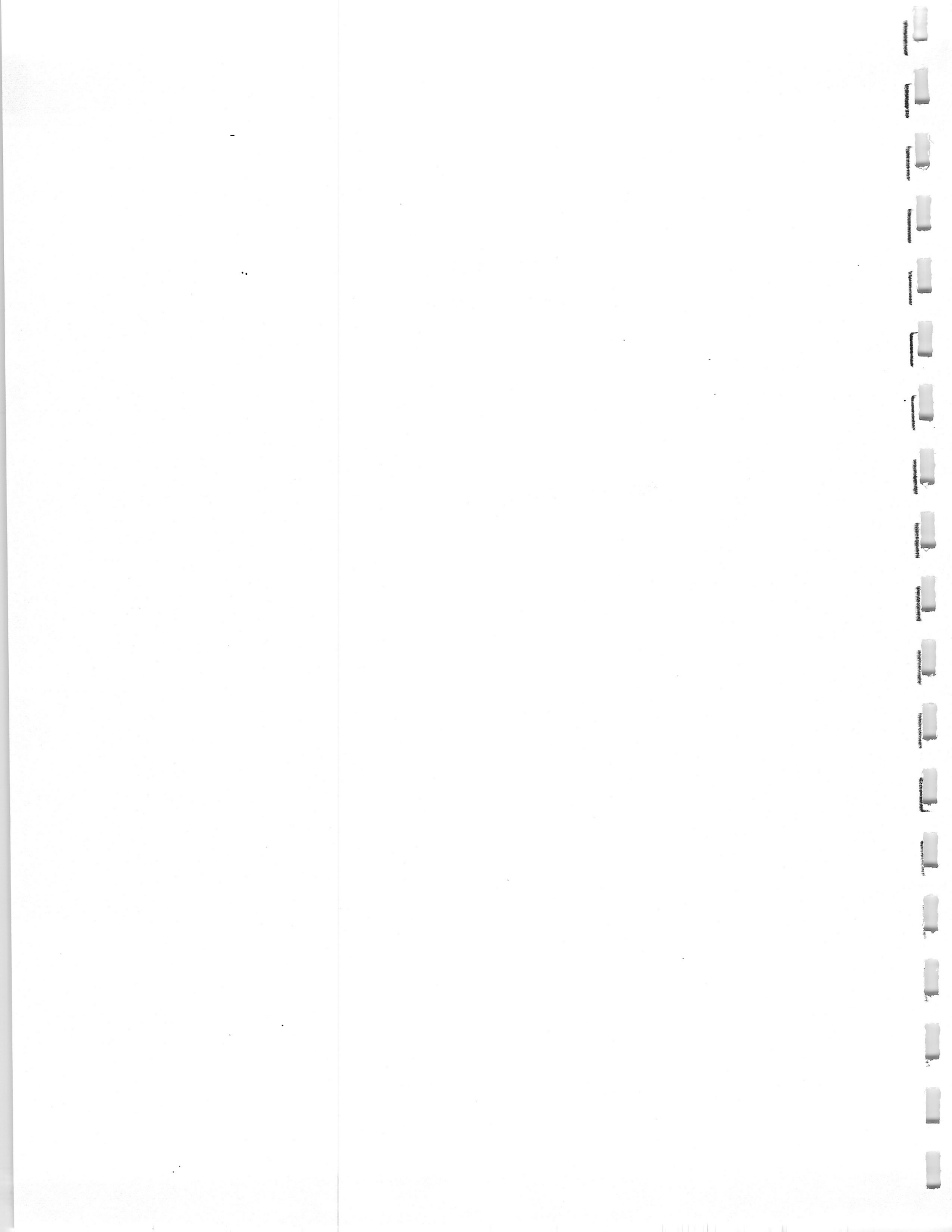
**Reference:** Robinault, 1973.







SECTION II  
Postural Control



## POSTURAL CONTROL, SEATING, AND PROTECTIVE DEVICES

Adaptive devices and equipment can provide a valuable link between the severely disabled individual's limited responding abilities and his/her capacity to more fully experience the world. Because positioning is important to all functions, it cannot be overemphasized. Positioning is not just seating, but refers as well to body alignment in standing, lying, sitting on the floor, and performing any activity - e.g., dressing, bathing, toileting, playing games.

The person who does not develop normally due to a severe developmental disability may not learn to roll, sit, crawl, stand, or walk as soon as the normal person. This severely impaired person may never be able to accomplish these skills without aids. If the person does not take the initiative him/herself to move about, s/he may be left lying in a crib or playpen most of the time, making his/her environment limited to the same stimuli over and over again.

Besides the inhibition of the severely disabled person's interaction with his/her environment, lack of attention to proper positioning can cause deformities to develop due to muscle imbalance. These deformities may become fixed, making it difficult to put the person in functional positions for feeding, hand activities, and/or speech; further limiting their opportunities for development. The prevention and/or correction of deformities is the prime consideration for proper positioning.

It is also important that the person not be left in the same position for long periods of time. The normal person is constantly shifting his/her position and, through this normal body movement, becomes aware of him/herself and his/her body parts and how they feel when moving about; thus s/he develops control. The child who lacks this voluntary mobility needs to have a planned program to help him/her develop this awareness of movement as well as his/her normal reflexes.

Another consideration for proper positioning is the creation of a stable base from which the person may function. If the person is to use his/her hands for a task, s/he must be positioned for optimum efficiency. S/he needs to be in a secure, comfortable position and may need to have his/her arm or leg stabilized or restrained to prevent excess involuntary movements.

It is only through careful observation of each person that the best choices for seating devices can be made. It is essential that a person should at all times be given the opportunity to use whatever potential abilities s/he has. Allowing him/her to control and adjust his/her position by him/herself whenever possible can help his/her development of improved balance. Thus, the outside support given to him/her and the adjustments should be kept to the absolute minimum, with no interference with his/her own movements, and removal of the support as soon as it is unnecessary.

Protective devices are utilized to protect the head and face primarily. Individuals with handicaps may fall because of motor imbalance, lack of strength, or even visual impairments. Devices may also be constructed to protect other important body parts.

**Reference:** Finnie, 1974.

### Adjustable Mini-Prone Board

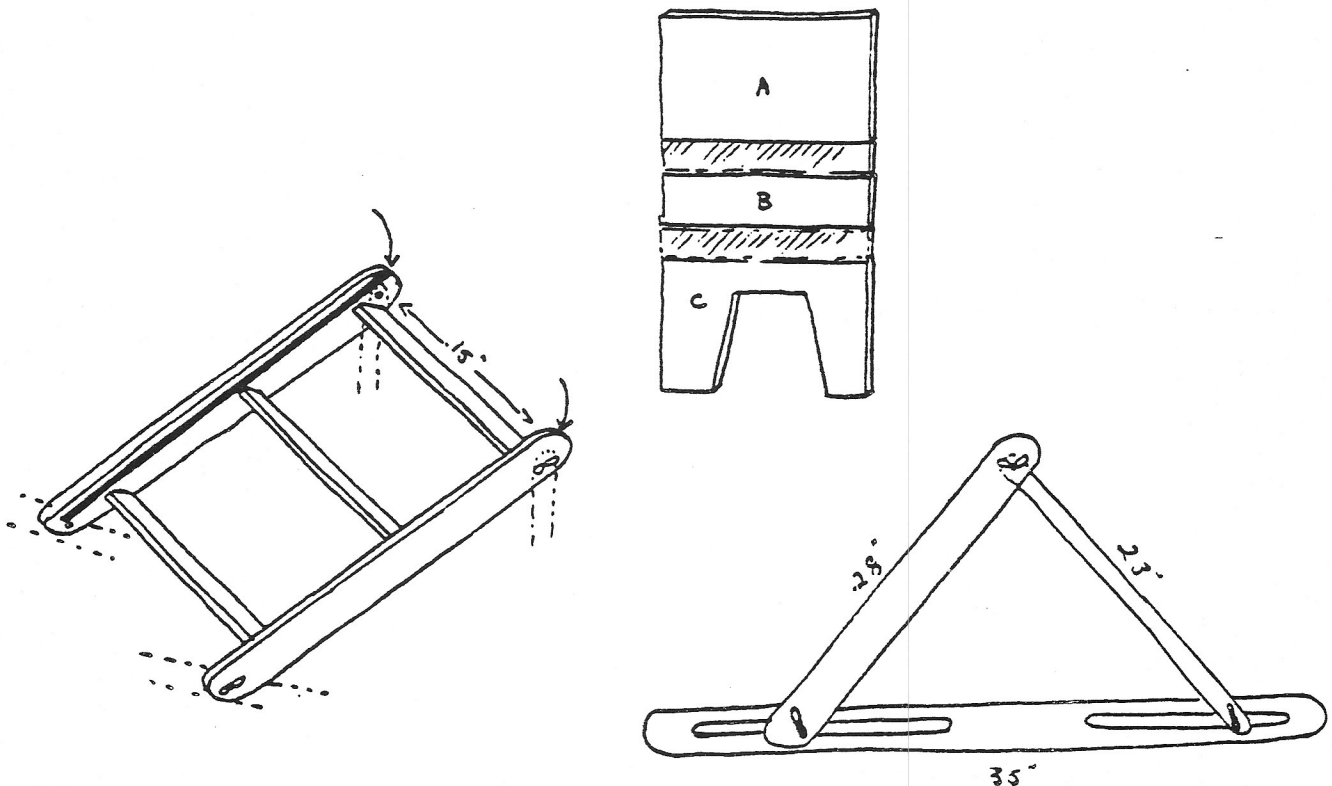
**Purpose:** To help prevent contractions from developing at the hips, knees, and ankles, and also to place the child in a more optimal position for various activities that involve the use of his/her hands. Difficulties with eye-hand control may be addressed sooner.

**Suggested Uses:** The child may enjoy a new view of his environment and of the people and activities around him - all essential adjuncts to learning; for example, use of this device can help with the first steps toward self-feeding. Especially useful with the younger child.

**Materials:** Wood, wing nuts, drill, coping saw, jigsaw.

#### **Construction/Design:**

The adjustable mini-prone board provides a number of different angles for the child, i.e., between lying and standing, the adjustment is made possible by moving the wing nut. The frame is made of wood.



**Cautions:** Child should never rest or hang over top of board and should be placed so that he can extend actively while he uses his hands.

**Maintenance:** Check tightness of nuts and joints. Watch for splits in the wood.

**Reference:** Finnie, 1974.



## Bolster

**Purpose:** To facilitate head lifting and back extension or to prevent scissoring of legs.

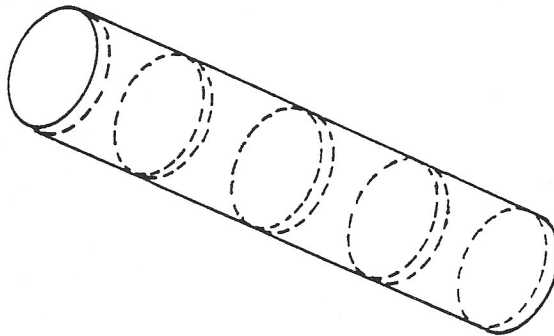
### **Suggested Uses:**

1. Prone positioning.
2. Encourages thoracic spinal extension.
3. Encourages head righting in prone position.
4. Encourages weight bearing on forearms and on hands.
5. Encourages sitting balance: forward, sideways, backwards. (Protective extension of arms and equilibrium, reaction of legs.)
6. Provides for hip abduction in sitting.

**Materials:** Carpet tubing for smaller bolsters, hard cardboard tubes of larger diameter, cardboard casings, vinyl, plywood disks, 1" foam, washable fabric.

### **Construction/Design:**

1. If cardboard casings are used, they should be reinforced by wedging and nailing plywood disks, 1' apart, throughout the roll and at each end.
2. Extra firm foam (2" to 3" thick) can be used to pad the outer surface of the tube.
3. Entire unit should then be covered with a machine-sewn, waterproof, vinyl sleeve, which can be either purchased or made at home.
4. An outer cover of washable fabric will add to comfort and cleanliness.



**Cautions:** Child or infant should not be allowed to become physically tight when seated on bolster. Spasticity is noted when the trunk and/or arms pull down into flexion. If this happens, the bolster can be gently rocked from side to side in order to decrease the tone of trunk and limbs. The slow rolling of the bolster is continued until tightness is sufficiently reduced so that the child can again sit with an erect spine and his arms can reach forward with straight elbows.

**Maintenance:** Keep clean.

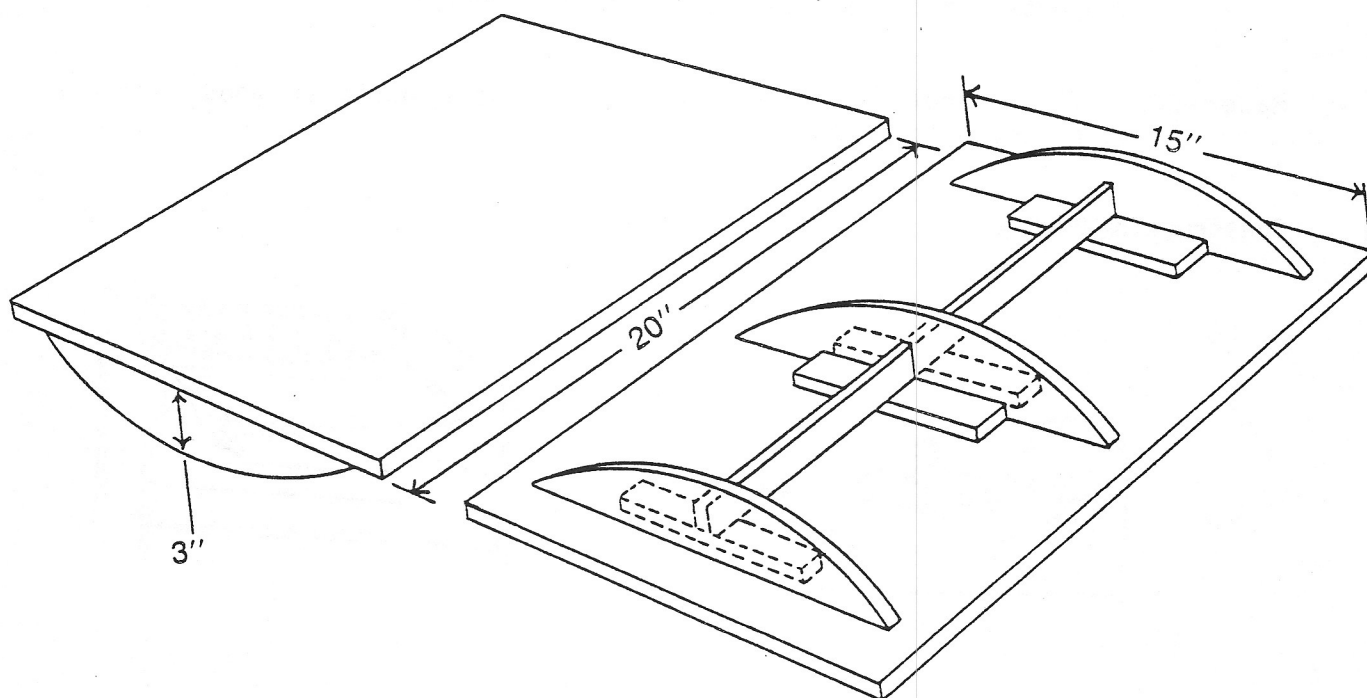
**Reference:** Connor, 1978.

## Equilibrium Board

**Purpose:** For use in equilibrium responses and balance activities, in various positions.

**Suggested Uses:** Encourages balance practice in prone, supine, sitting, kneeling, and standing positions.

**Materials:** Pine (1" x 2-1/2") for the supporting braces on bottom, plywood (3/4") for board and rocker, carpeting to cover top of board and to prevent slipping.



**Cautions:** Never leave a child unattended when using this device.

**Maintenance:** Maintain security of joints.

**Reference:** Richardson et al., 1975.

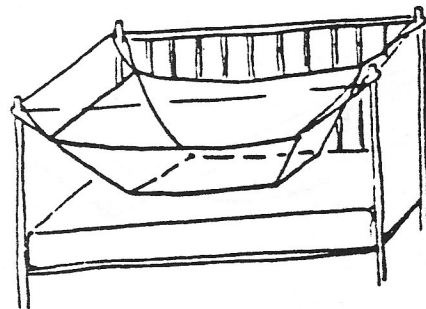
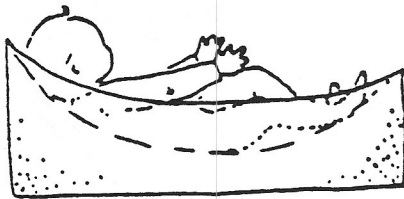
## Hammock

**Purpose:** Useful for the child with two types of problems: (1) the child with a strong extensor pattern, causing him to pull back his head and arms, arch his back, and possibly scissor legs, and (2) the child with low muscle tone who assumes a froglike posture when lying supine. Encourages proper body alignment and decreases the likelihood of the child assuming an abnormal posture. Supports and brings forward the child's shoulders, preventing his head from pushing back. Hammock is soft and molds itself to the child's shape. Encourages bringing hands together and to mouth; child also sees feet, realizes they're his, and tries to reach for them and bring them to his mouth. By swinging hammock different ways, the child is encouraged to roll, kick, sit up, play with toys, etc.

**Suggested Uses:** May be used for sleeping during the day. Useful as well between two uprights in door frame, outside between two trees or supports, or between the uprights of a crib.

**Materials:** Thick, reinforced cotton or sailcloth, optional wooden dowels along edges for support.

### **Construction/Design:**



**Cautions:** Do not allow the child to remain in hammock for more than 45 minutes at a time.

**Maintenance:** Keep clean. Check periodically for any weaknesses in hammock.

**Reference:** Finnie, 1974; Connor, 1978.

### Mobile Prone Board

**Purpose:** Prevents contractures from developing at the hips, knees, and ankles by placing person in a more optimal position for various activities. May increase leg extension, head control, and provides weight bearing on the legs.

**Suggested Uses:** This board can be made any size. Because it has an adjustable board, the angle at which the child lies can very easily be varied.

**Materials:**

Top board: plywood 1/2" x 12" x 30"

Base: plywood 1/2" x 12" x 30"

Angle adjustment block: softwood approximately 2" x 4" x 12"

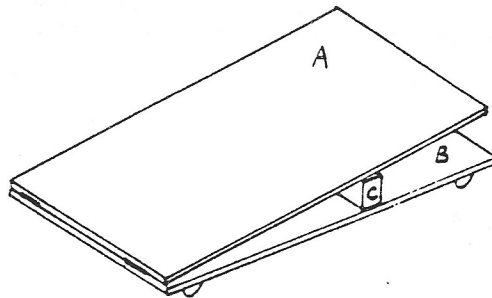
4 casters

2 hinges

Screwdriver

**Construction/Design:**

1. Join top board A to base B with hinges.
2. Screw caster to each corner of base B, approximately 2" in from the corners to protect the child's fingers.
3. Place angle block C between base B and top board A to adjust angle.



**Cautions:** Never leave child unattended when child is using this device. Be sure there are no rough edges.

**Maintenance:** Occasionally check wheels for foreign materials. Periodically check for weaknesses in device.

**Reference:** Caston, 1982.

## Prone Board

**Purpose:** Helps to prevent contractures from developing at the hips, knees, and ankles, and also places the child in a more optimal position for various activities. Encourages prone positioning, may help to increase spinal and leg extension, head control, and provides weight bearing on legs.

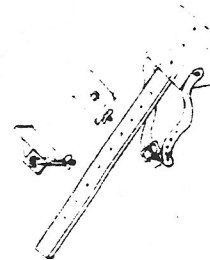
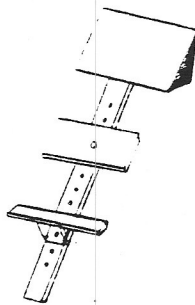
**Suggested Uses:** Using prone boards, several children can be placed around a table simultaneously, for play or for feeding. If footboard is padded and elevated, the prone board can also be used for kneeling.

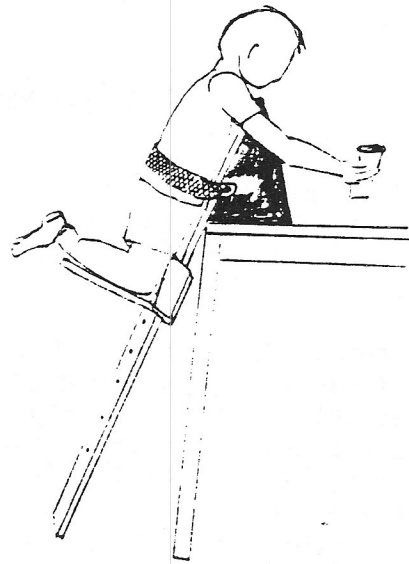
**Material:** Vinyl or fabric to cover padded pieces, padding to upholster cross bars and chest piece, 1" bolts, wing nuts to fit bolts, 3/4" wood.

### **Construction/Design:**

1. Chest piece, padded.
2. Knee board, padded, can be fitted with an abduction wedge.
3. Footboard.

All features are easily adjusted by using bolts and wing nuts through holes in upright. Length of upright depends on angle required and position (i.e., at table, sink). Use 4" x 2" wood. Chest piece 8" wide; length must go 6" beyond arms on either side. Knee board 8" wide, 14" long. Velcro may be applied around the footholder and strapped over the front of the child's shoe. Another strap across the buttocks maintains hip extension and provides security. Knees rest against the lower cross bar; armpits should be 1" above the upper padded chest board. Footplates are attached by set screws to slots on the standing board.





**Cautions:** Child should never just rest or hang over the top of the board and should be placed so that he can extend actively while he uses his arms and hands.

**Maintenance:** Be sure nuts, bolts, and all joints are secure.

**Reference:** Connor, 1978; Finnie, 1974.

## Sandbag, Carpet Roll, Wedge

**Purpose:** To inhibit development of abnormal posture patterns and movement, while enabling the child to maintain his balance and thus permit him freedom to use his hands.

**Suggested Uses:** Place the child on his stomach with arms over the front edge of the wedge and the edge at the child's armpits. Use carpet rolls at child's sides to maintain good trunk position (chest to hips). A strap can be placed around carpet rolls, child, and wedge at waist level for safety and to help maintain the position. Sandbags are placed beside the knees to maintain legs in straight position. All or some of these things may be used to establish good prone positioning. The prone position allows the child to use his hands freely and may also be used to stimulate maintenance of head control.

### **Materials:**

Sandbag: Canvas or closely woven material, sand or other pliable filler material, scissors, needle and thread.

Carpet Roll: Carpet samples about 18" x 18" (low pile with bound edges are recommended) masking or duct tape.

Wedge: Dense foam 3"-4" thick or 3 boards (1/2"-3/4" plywood), 1" foam, washable material for cover (optional) or cover with blanket or small rug, electric knife, jigsaw.

### **Construction/Design:**

#### Sandbag:

Sew a bag from closely woven or canvas material. Bags should be rectangularly shaped and about the size of a 10# bag of flour. Each bag should weigh approximately 10 lb.

#### Carpet Roll:

Roll carpet as tightly as possible and secure with 2-4 bands of masking or duct tape.

#### Wedge:

Cut from 3"-4" dense foam or build from 3 boards: 1 top board 18" x 24", and 2 side upright triangular shape and 1 front piece, depending on length of the child's arms (measure from armpit area to elbow bone when elbow is bent for accurate arm length measurement). Cover top and front with 1" foam, and washable cover (optional). 1/2" - 3/4" plywood recommended.



**Cautions:**

1. Legs should be straight with feet uncrossed.
2. Never leave child alone unless secured well with a safety strap or bolstered in place with sandbags and carpet rolls.
3. Change position every 20 minutes.
4. DO NOT USE this position if your child cannot maintain independent prone head control. Ask your therapist for proper use of this position if your child cannot maintain the correct position.

**Reference:** Kent, 1982.

## Sidelyer (Child)

**Purpose:** Provide a comfortable and secure sidelying position so that hands can be brought together at midline, to provide maximum eye contact with hands, and to facilitate fine motor manipulation.

### **Suggested Uses:**

1. Alternate head piece placement each day so child lies on both sides.
2. Position child in this when class is involved in floor activities.
3. Make baseboard wide enough so another child can be positioned facing the first child, which is good for social interaction.
4. Parents can use a similar model at home for times when child would otherwise be positioned on his back.
5. Position reactive toys (e.g., buzzer box, ring pull) beyond child's reach, creating a good, independent eye-hand coordination activity.
6. For a child with severe hip extension, slip a 3" wide cloth tie between base and back pieces so that it fits around back of sidelyer and child's hips and secure with Velcro.

**Materials:** Wood, foam padding, vinyl, L braces, Velcro, hot glue and gun.

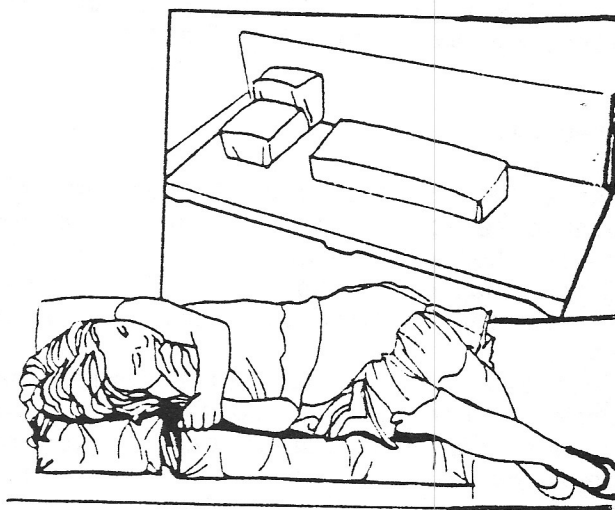
### **Construction/Design:**

1. Measure child's height and add approximately 8" to accommodate growth.
2. Cut a base about 18" wide and as long as above. Cut the back about 14" wide. Pad and cover with vinyl. Attach back to base with L braces.
3. Cut foam for trunk support. It should measure from the child's underarm to just above midthigh. Cover with vinyl. Attach to base with Velcro so that the pad can be moved in and out.
4. Cut head piece out of foam either as one solid piece or as two rectangles glued together. The small piece behind the head is intended to prevent the child from throwing his or her head back into extension. Cover with vinyl. Attach Velcro loop to both ends of base of sidelyer at different levels. Attach Velcro hook to bottom of head piece. This will allow head piece to be moved, but secure, so child can lie on either side.

**Cautions:** Be sure no rough edges are exposed.

**Maintenance:** Wash after use.

**Reference:**



## "Six-Pack" Hammock

**Purpose:** Encourages proper body alignment and decreases the likelihood of the person assuming an abnormal posture. Also provides alternate seating.

**Suggested Uses:** May be used both indoors and outdoors.

**Materials:** A minimum of 75 plastic six-pack carriers, clothesline, 2 wood sticks, 2 metal rings, 2 "S" hooks.

### **Construction/Design:**

1. First determine the size of the hammock you are going to make. If you have selected a place to hang the hammock, measure the distance between the two hanging points. The "body" or people part of the hammock should be about half that dimension. The harness that supports the hammock at either end will take up the rest of the length.
2. A good two- or three-kid size hammock may be made from 90 six-pack carriers - nine across and ten long. You can collect the six-pack carriers over a period of time or you might go scavenging around a campground or a ball park. If you are really in a hurry, a local soda or beer "bottler" who uses six-pack carriers might help you.
3. The body of the hammock and the harness are both made at the same time by weaving clothesline through the holes in the plastic carriers. The hammock is woven one lengthwise row at a time. Lay out a single row of carriers to the length of the hammock body you want. Place the carriers lengthwise so that their end "circles" interweave and partially overlap (Fig. 1). Now add a second row so that the adjacent circles of the two rows interweave and partially overlap.
4. Cut a length of clothesline a few feet longer than the entire length of the hammock (body and harness). Weave the clothesline the length of the row through the holes in the carrier where they overlap. Weave the cord over, through, under, up, over, through, under, up (Fig. 2). Adjust the clothesline so that there are equal lengths of cord at either end.
5. Continue to add rows of carriers in the same way until the hammock is the width you want. After the last row, weave another length of clothesline through the circles along each of the two outside edge rows.
6. Lay the hammock flat and square on the floor. To make the "spreaders" - the devices used to keep the ropes separate from one another - find two flat sticks and cut each of them a few inches longer than the width of the hammock. Place one of the sticks at each end of the hammock body and mark the positions of the ropes on

- the stick. Drill a hole at each mark down the center of the sticks. The holes should be large enough for the rope to go through easily.
7. Carefully make a single loop knot on each cord where it leaves the body of the hammock. Do this on both sides of the hammock. Place a spreader at each end of the hammock and thread the ropes in order through the holes in the spreader.
  8. Push the spreaders up against the knots. Using two more lengths of clothesline, weave the end circles of the carriers to the spreader sticks. Tie the cord at each end of the stick (Fig. 3).
  9. Gather the cords at one end of the hammock and bring them together at the end. Tie each cord individually to a large ring, being sure to adjust each cord so that the hammock will lie flat on the floor with no cords kinking. Snip off any excess cord ends.
  10. You can hang the hammock directly to the support eye hooks using "S" hooks or, using two more "S" hooks and two short lengths of chain, you can make the hammock height adjustable.

Figure 1.

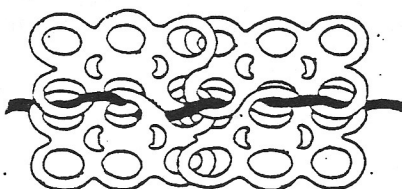


Figure 2.

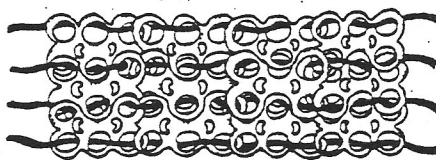
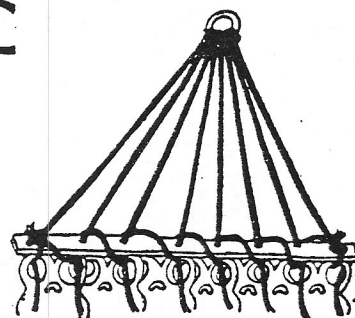


Figure 3.



**Cautions:** Never leave the child unattended while in this device.

**Maintenance:** Be alert to weaknesses in device. Repair or replace as necessary.

**Reference:** Caney, 1975.

## Stand-in Table - Type 1

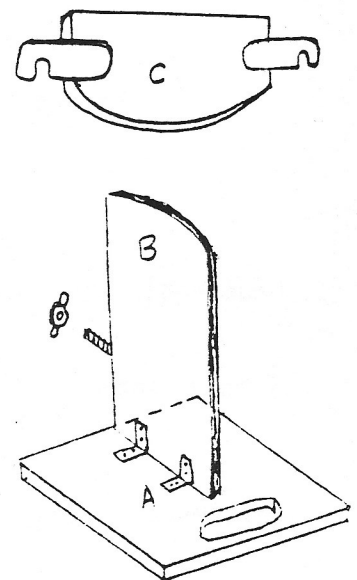
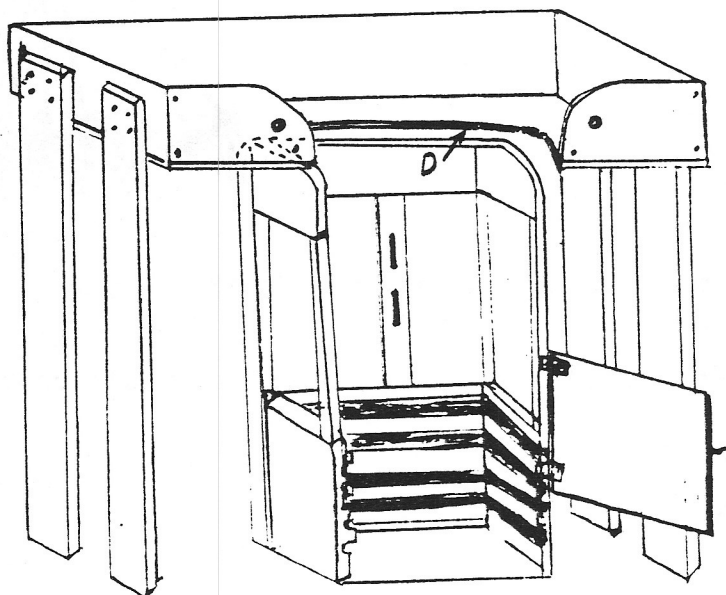
**Purpose:** For individuals with some standing ability and trunk control; provides vertical positioning and thereby enhances learning opportunities.

**Suggested Uses:** Although the height of the table is stationary, the person may be raised via the footboard when less support is required. There is also an adjustable leg spreader for persons who scissor their legs.

**Materials:** Plywood, butterfly screws, metal plate, 1" padding (optional), formica or linoleum to line tabletop. For help with specific measurements for a particular child, you may wish to refer to the description of "Sitting Equipment: General Precautions and Measurements for Special Equipment," also provided in this manual.

### **Construction/Design:**

1. Footboard (a). Adjustable by placement at several levels.
2. Leg spreader (b). Slotted back makes height adjustable to level of footboard. A butterfly screw in front and metal plate in back hold the spreader in place.
3. Gate (c). This can be padded if necessary. A wide web belt may be used instead.
4. Cut-out area of table top (d). Cover with formica or linoleum.



**Cautions:** Check for rough wooden edges and make sure they are sanded down until smooth. Be sure there are no protruding nails.

**Maintenance:** Be sure joints are secure.

**Reference:** Robinault, 1973.

## Stand-in Table - Type II

**Purpose:** Provide proper positioning and enhance learning opportunities.  
Alternate positioning.

**Suggested Uses:** See uses of Stand-in Table - Type I.

**Materials:** Plywood (see construction for diagram dimensions), bolts, masonite, linoleum (optional).

### **Construction/Design:**

Dimensions given are for a child 2 to 4 years of age. For a larger person, measurements need to be increased proportionately.

1. Use plywood for the box. Width and depth are 10-1/2" x 10-1/2". Door is approximately 9" x 16". Attach bolts to door, one 4" from top, one 12" from top.
2. Use 5-ply plywood for runners. Two side pieces are needed, 2" x 25" each. Front strip is 2" by 30". Back strips should be long enough to reach the enclosure, depending on size of the box.
3. Use 5-ply plywood for the legs.
4. For table top, use plywood or masonite, 16-1/2" x 28-1/2", with cut-out for the box. Cover with linoleum or formica, if desired.
5. Use plywood or masonite for the rim. The front is 3" x 30"; sides, 3" x 18" each; back (2 pieces), 3" x 9-1/2" (or adjusted to size of box).
6. Make blocks of 5-ply plywood, 7-3/4" x 9". Placed in the box, these adjust height.

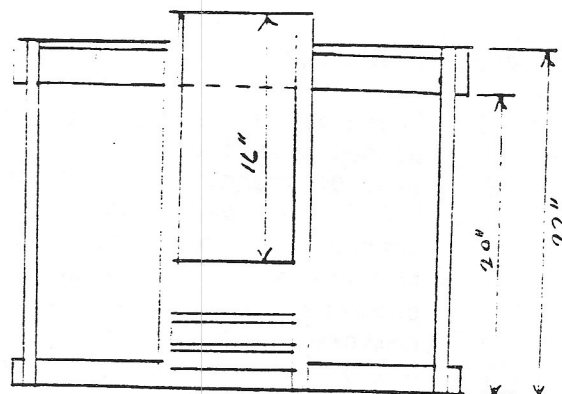
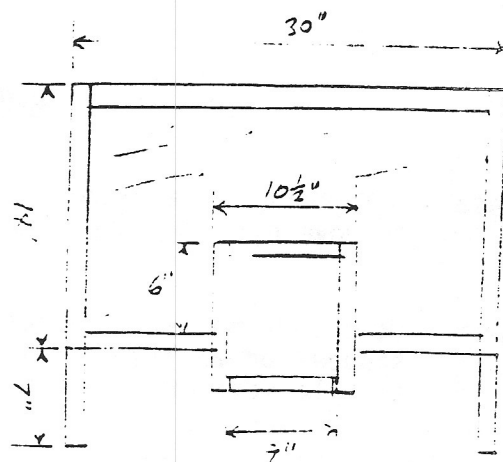
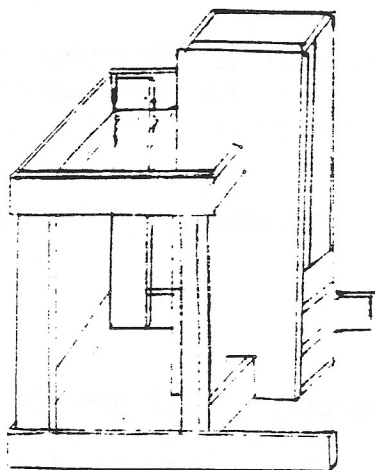
The overall height of the body box should be from a point about 2" to 3" below child's armpits to his feet, plus thickness of 3 to 4 5-ply plywood blocks on which the child will stand.

The body box should be inset in the tabletop for about 2/3 of its depth. Top of the table should come to a height about 4" lower than the top of the body box. The 1-1/4" rim around the table prevents toys from being knocked off.

For security, the door is latched with two bolts, one near the top and one near the bottom.

The table legs are secured firmly to the rim around the table top, and a framework is attached to the legs at the floor. The two side pieces of this framework constitute runners extending 7" beyond the back legs to prevent the table from tipping backwards. The frame is closed in at the rear and is attached to the body box with an additional 2-1/2" piece of plywood.





**Cautions:** Do not allow users to develop the habit of slumping against the body box. Drill enough holds in back door to allow air to circulate within the chimney. Be sure there are no rough spots or protruding nails.

**Maintenance:** Keep clean and be sure structure is secure.

**Reference:** Robinault, 1973.

## Support Frame

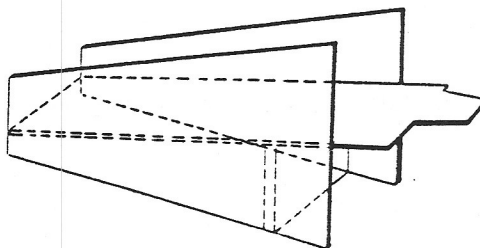
**Purpose:** A support frame places a person in a relaxed position, allowing him to move his arms freely and use both hands in activities.

**Suggested Uses:** Frame may be placed close to hand-involved activities, e.g., sandbox or an inflatable swimming pool, where the nonstructure and tactile stimulation of sand or water are enticing.

**Materials:** 1/2" plywood, foam, upholstery or naugahyde, double sandbag (optional), straps (optional).

### **Construction/Design:**

1. Frame is made of 1/2" plywood. The supporting surface and sides are padded with foam, covered with upholstery or naugahyde.
2. Size of frame is proportioned to the average measurements of a child 3-1/3 to 5 years of age. The overall length, approximately 29", supports the prone body from the superior portion of the sternum to the ankle. This length, as well as the height of the foot end, permits free dorsiflexion and plantar flexion and adds to the comfort of the child.
3. The 10" width of the bed extends from the ankle to the axilla. The width is reduced to 4" for the remaining 4" of length. Elevating head end 8" allows gravity to bring shoulders into flexion and the elbows into full extension. To control involuntary movements and prevent child from falling out, the sides of the frame have been raised 4" above the supporting surface. If additional security is needed, a double sandbag may be laid across the gluteal area or straps may be attached to the supporting surface to fasten the child in.



**Cautions:** Be sure there are no rough edges, protruding nails, or loose pieces.

**Maintenance:** Clean after use and check frequently for weaknesses in structure.

**Reference:** Robinault, 1973.

## Wedges

**Purpose:** Inhibits development of abnormal patterns of posture and movement, while enabling child to reach forward and use his hands. Offers alternate position option.

### **Suggested Uses:**

1. Prone positioning.
2. Encourages weight bearing on forearms and on hand with extended elbows.
3. Encourages midline positioning.
4. Can be used to free hands for play in prone position.
5. Supine positioning for feeding. Place wedge on parent's lap with widest part at knee and position child supine facing parent.

### **Materials:**

Wedges can be made from foam, canvas, inflatables, or from wood with a layer of foam and a cover of washable material. Materials such as spray vinyl may be used to make it waterproof and easier to clean. Here are the materials necessary to make one kind of wedge.

3 boards 18" x 22" (1/2" - 3/4" plywood is recommended), 18" x 24", and 18" x 6-10"; 1" foam; washable cover.

### **Construction/Design:**

Requires 3 boards: bottom board 18" x 22", top board 18" x 24", one upright 18" x 6"-10" depending on length of child's arms (measure from armpit area to elbow bone when arm is bent). Cover front and top with foam and washable cover.

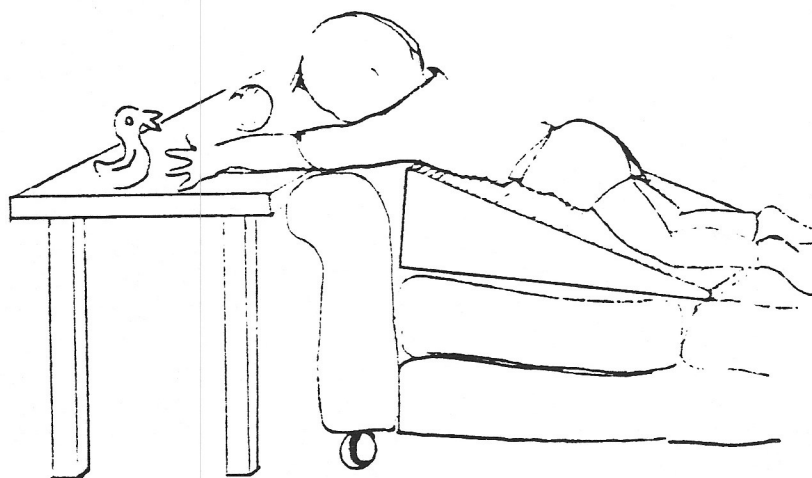
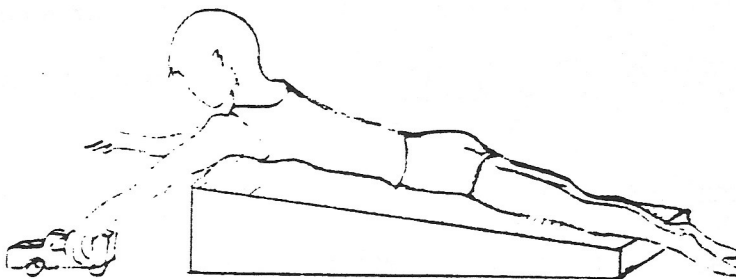
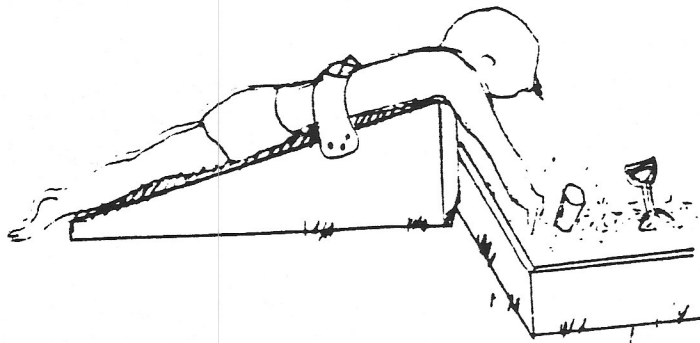
### **Cautions:**

1. If child needs wedge with a steep incline, it is essential that the play area be raised. Too often the value of a wedge is lost by having a play area that is too low, which instead increases flexor spasticity. The child will manage to lift his head but at the same time his shoulders will press down and turn in, making it difficult or impossible for him to use his hands. If the child is asymmetrical, the use of sandbags will correct this; place in along side his trunk and under shoulders, or by the side of the hips. Never place a sandbag on a child's bottom while he is on his tummy as this will increase his flexor spasticity.
2. See that feet do not become stiff and pointed; regularly spend a few minutes bending his ankles, keeping his feet up, while keeping his

- legs turned out. Also check to see that the hips do not become stiff.
3. Continual supervision is advised.

**Maintenance:** Keep clean, watch for any weaknesses in structure, and be sure there are no rough edges or protruding nails.

**Reference:** Finnie, 1974.



## Sitting and Standing Equipment:

### General Precautions and Measurements for Special Equipment

#### **General Precautions**

1. Measure the chair and the person, allowing for growth in height and width.
2. Use sturdy materials that can be cleaned.
3. Be sure the base of each item is wide enough to avoid tipping.
4. Use only lead-free paint on any equipment or toys for children.
5. Do not use curved plywood seats that make sitter's legs adduct.
6. Do not let child's feet dangle; if necessary, use nonskid footrests or footstools.
7. Do not put pressure on the back of the head if it accentuates person's extensor thrust.
8. If sitting balance is poor and extensor thrust is prominent, make seats or seat inserts at an angle so that the child is flexed more at the hips than the usual 90-degree sitting position.
9. If the chair is not used against a table, provide a lapboard or tray to give security, to give stability by supporting the arms, and to allow for activities where the hands need to be free.

#### **Measurements for Special Equipment**

All measurements for equipment should be taken when the child is fully clothed. A yardstick, not a cloth tape, should be used. In the following list of dimensions to be measured, the letters in parentheses denote the measurements illustrated in Figures 1-4.

Distance from seat to top of head (A). This distance (Fig. 1) gives the minimal height of the backrest for a child needing full head support (upright or tilted). In practice, it is best to make the backrest 6 inches longer to allow for growth.

Distance from seat to top of shoulders (B). This distance is the minimal height of the backrest if shoulder support only is required. If side supports are needed for the head, the bottom edges of the supports must be above this level to give shoulder clearance. Allowance should be made for growth.

Depth of seat (C). The measurement should be made with the child's buttocks against the chair back. The seat should be deep enough to support

the thighs but should not cut into the back of the knees. There should be a space the width of two fingers between the back of the knees and the end of the seat. Use the measurement of the shorter thigh if a difference exists between the legs.

Depth of footrest (D). The footrest should be deep enough to support the whole length of the foot with the shins at right angles to the thighs. The foot must also be at right angles to the shins, never in a foot-drop position. Some individuals, however, need some dorsiflexion, the degree of which should be determined by optimal function.

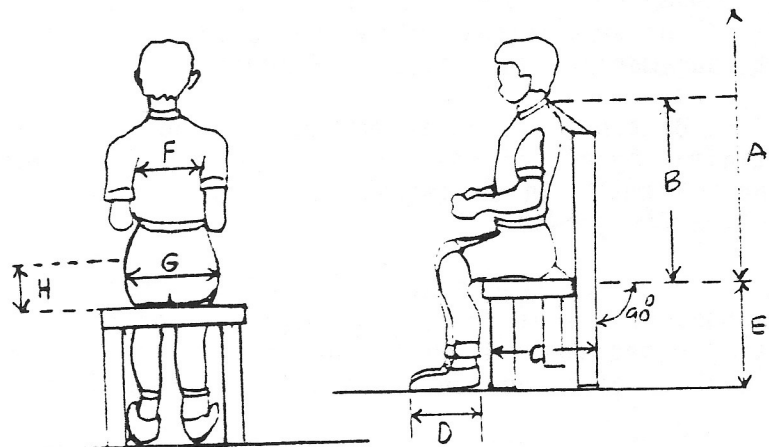
Distance from seat to footrest (E). The height of the footrest is important. The foot should be fully supported, but the thighs must not be lifted from the seat.

Width across shoulders (F). The backrest should be wide enough to support the whole of the back but should allow for free movement of the arms (Fig. 2).

Width across hips (G). This measurement should be made while the child is seated. If side support is needed, the child should fit snugly between the side pieces. Since allowance should be made for growth, temporary boards should be fitted inside the fixed ones to reduce the seat width to the required measurement. These boards can be replaced with thinner ones and discarded as the child grows.

Distance from seat to elbow (H). Side supports should be 1 inch less than this measurement to give clearance for the elbows and to allow the chair to slip under the table. Table or desk surfaces should be 1 inch higher than the elbows to give support to the arms.

If desired, the seat, side supports, and back of the chair may be upholstered with half-inch-thick foam rubber covered with vinyl or cloth. Allowance must be made for this when measurements are taken. In deciding upon upholstering, certain precautions are advisable: A child who perspires freely may be more comfortable without foam and plastic padding. However, side supports for the head should always be padded and upholstered.



Reference: Robinault, 1973.

## Adapted Stroller

**Purpose:** Prevent deformities due to muscle imbalance and allow use of a commercial stroller for transport.

**Suggested Uses:** The following suggestions can be used to adapt a commercially-made stroller to the needs of an individual child.

**Materials:** Plywood (thin piece) for backrest, layers of foam rubber or thin cushion of small foam chips, washable fabric, 2 wool cloths, broad piece of webbing, sandbags, wooden rail. For specific measurements for a given child, it may be helpful to refer to Sitting Equipment: General Precautions and Measurements for Special Equipment, included in this manual.

### **Construction/Design:**

1. Make sure backrest is firm. Use thin piece of plywood, layer of foam rubber, and cover with washable material.
2. Seat: Use a piece of thick foam rubber with no cover to prevent slipping, or a thin cushion of small foam chips.
3. A footrest can help. If the child pushes himself backwards when feet contact firm, non-slip surface, get rid of the footrest until the child learns not to push back. If necessary 2 padded blocks screwed onto chair can keep legs apart and hips turned out.
4. Groin straps are useful if the child has no sitting balance.
5. Lack of stability, balance, and head control can be aided by placing sandbags on sides of hips or wooden rail across arm rests to hold onto.
6. A padded neck rest relieves pressure on the back of the head, helping to minimize extensor thrust.
7. A strap holds the insert to the stroller. A foam insert within a wooden frame can be covered by a washable cover.
8. A wide safety belt can be provided.
9. For a child afraid of falling forward, a tray or broad piece of webbing (stretched in front of waist) can encourage a secure feeling.

**Cautions:** Be sure child is supported where necessary when sitting. Be sure backrest and seat are firm. Be sure angle of groin straps is correct (tied down and backward).

**Maintenance:** Clean regularly and maintain security of joints and bolts.

**Reference:** Finnie, 1974.



## Adjustable Chair

**Purpose:** Provides supportive seating and encourage good head and trunk control and enables the child to feel secure and comfortable while engaged in a variety of activities.

**Suggested Uses:** Any time or place seating is required.

**Materials:** Plywood for chair (1/2" thick), 5/8" wing nuts, 5/8" bolts, 5/8" nuts.

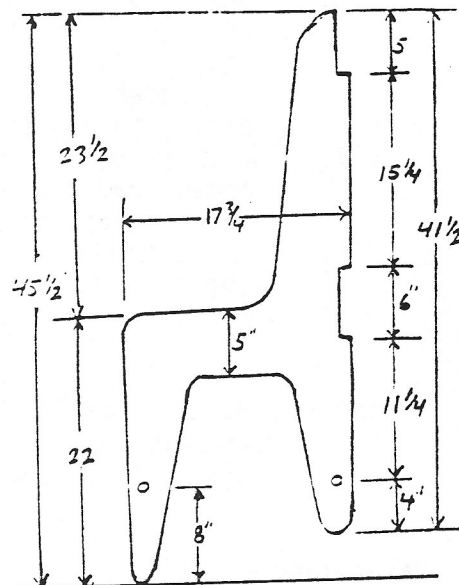
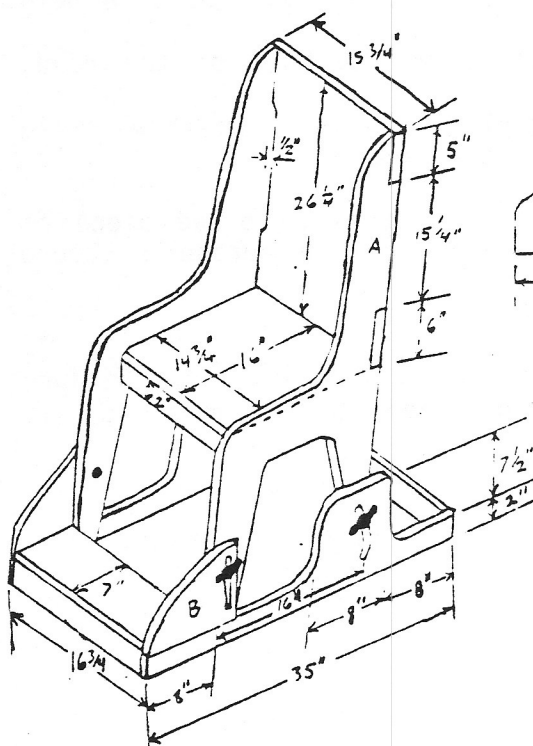
### **Construction/Design:**

1. All stock should be 1/2" thick.
2. Unspecified radii are 1".
3. All wing nuts, bolts, and nuts are 5/8" in diameter. Holes (D) should be large enough to accommodate this size bolt.

**Cautions:** Before constructing the chair, decide what advantage this type of chair would have over a wheelchair with clinically designed inserts made to meet the patients' needs.

**Maintenance:** Keep clean and maintain security of bolts and joints.

**Reference:** Robinault, 1973.



ALL DIMENSIONS  
ARE IN INCHES



## Adjustable Corner Chair

**Purpose:** Improves head and trunk control, increases intracostal breathing, and assists in acquisition of visual-motor coordination.

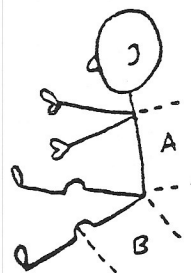
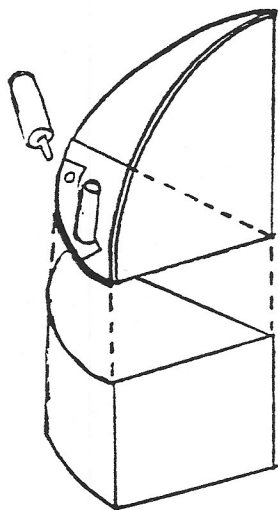
**Suggested Uses:** To aid the child at any time to receive a variety of environmental stimuli.

**Materials:** 2 cardboard grocery cartons, shag carpet squares, self-adhesive decorating (e.g., contact paper).

### **Construction/Design:**

A cardboard grocery carton is used for construction of this corner chair. Two sides and the top are cut out and stapled to the remaining two sides and the base for reinforcement and greater stability. The inside surface is covered with shag carpeting to increase comfort. The sides are approximately 14" high; the base about 14" x 14". A second grocery carton, with a cutout to fit around the child, may serve as a table. The table is approximately 8" high, with an area 13" x 13", and may be covered with self-adhesive decorating material (e.g., contact paper).

When measuring, take shoulders to base (see A), and base to knee (see B), and allow 6"-8" for angle.

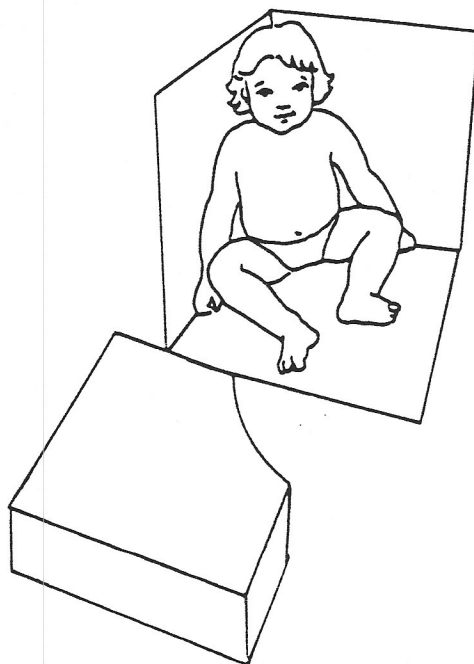
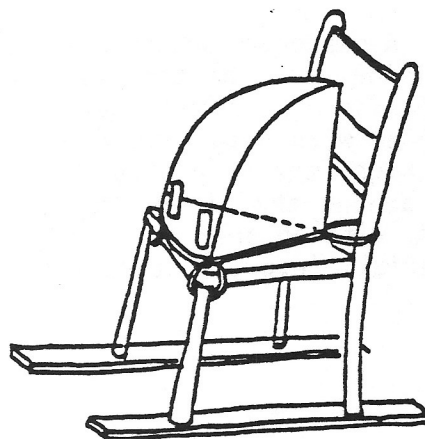


**Cautions:** Never leave child unsupervised in chair for long periods of time. Use care when placing the seat on a counter or another chair - be certain the seat is secure.

**Maintenance:** Repair weaknesses in chair. Replace if necessary.

**Reference:** Connor, 1978.

The principle of the triangle adapted to the seat of an ordinary chair, using just the side pieces and two posts. Skids are optional. Chair can be moved from room to room, from chair to floor, to the car, or used when visiting other people's houses.



## Adjustable Floor Table

**Purpose:** Enables the child to participate in a variety of table-top activities.

**Suggested Uses:** Allows the work surface to be fixed at the correct height and at any angle.

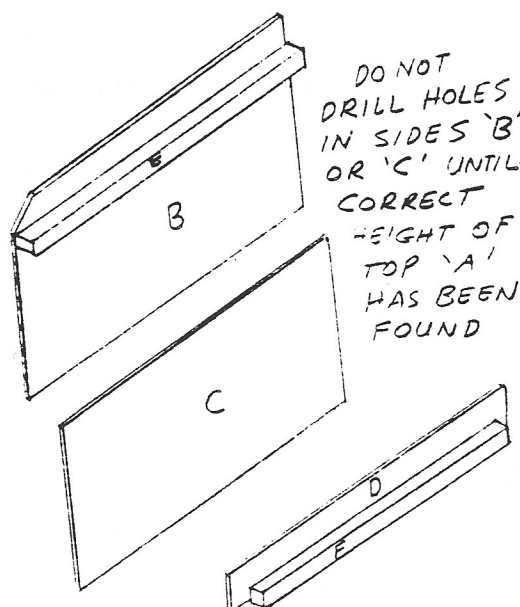
### **Materials:**

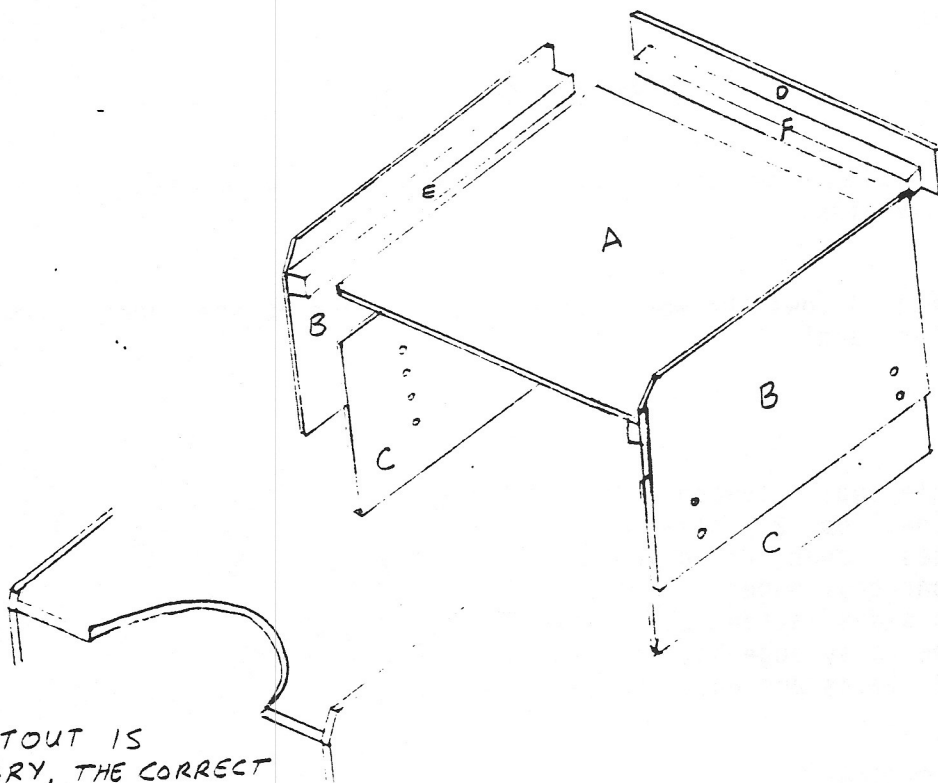
Table top: plywood 1/4" x 12" x 18"  
Sides, top, 2: plywood 1/4" x 8" x 12"  
Sides, lower, 2: plywood 1/4" x 10" x 12"  
Front tray edge: plywood 1/4" x 2" x 18"  
Top sides batten, 2: softwood 1" x 1" x 12"  
Front tray edge batten: softwood 1" x 1" x 16"  
1/2" bolts and nuts, screws.

### **Construction/Design:**

1. Remove corners from sides B.
2. Fix battens E to sides B 1-1/4" from the top.
3. Fix battens F to tray edge D.
4. Fix sides B to top A.
5. Fix tray edge D to top A. The batten F goes underneath top A.
6. Fix sides lower C to sides B with countersunk screws and nuts.

With the child sitting comfortably and at the correct posture, adjust the angle and height.





IF A CUTOUT IS  
NECESSARY, THE CORRECT  
SIZE AND SHAPE CAN BE  
OBTAINED BY BENDING A  
LENGTH OF COAT HANGER  
WIRE AROUND THE CHILD  
WHILE HE IS IN A SITTING  
POSITION.

**Cautions:** Be sure device is secure at all joints to prevent injury to the child.

**Maintenance:** Regularly check for rough edges and/or loose screws or bolts.  
Keep clean.

**Reference:** Caston, 1982.

### Arm and Shoulder Rests

**Purpose:** Side panels provide arm rests and give side support to shoulder.

**Suggested Uses:** If the sides are made high enough, a head rest can be added. If the seat extends over the side of the chair, it will be necessary to use spacers between the chair leg and the side panel for stability. This device can be used alone or in conjunction with other chair adaptations if the child is severely physically handicapped. Even if several conversions have to be made, this device will still look like a school chair.

#### **Materials:**

Side panels, 2: plywood 1/4" or 3/8". Take measurements from the child and chair.

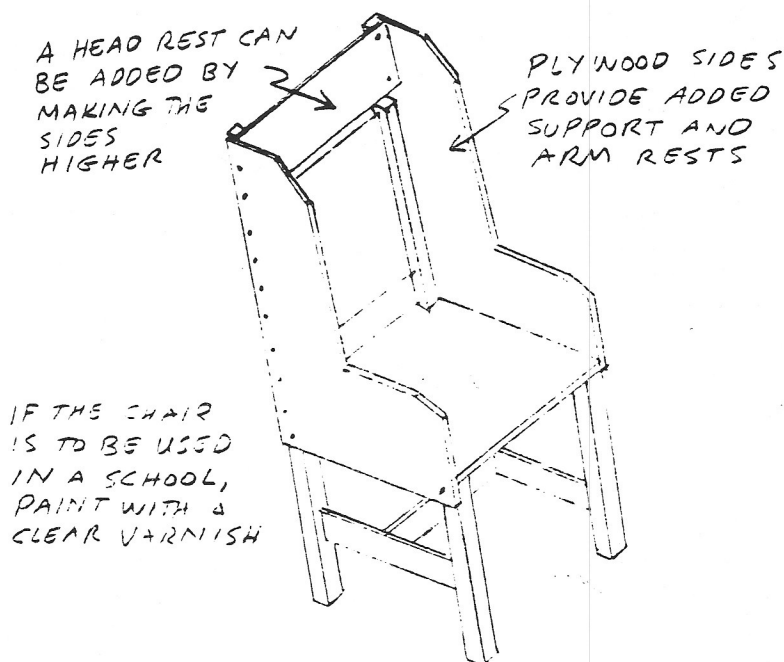
Head rest: plywood 1/4" or 3/8". Take measurements from chair.

Head rest: battens, 2: softwood 1" x 1"

Clear varnish

#### **Construction/Design:**

1. Cut out side panels to suit child's measurements.
2. Fix side panels to side of chair.
3. Fix head rest if required.



**Cautions:** Be sure all wooden edges are smooth, no nails protrude, and the device is structurally secure.

**Maintenance:** Keep clean and periodically check for weakness in device such as loose joints, rough spots in the wood, and protruding nails.

**Reference:** Caston, 1982.

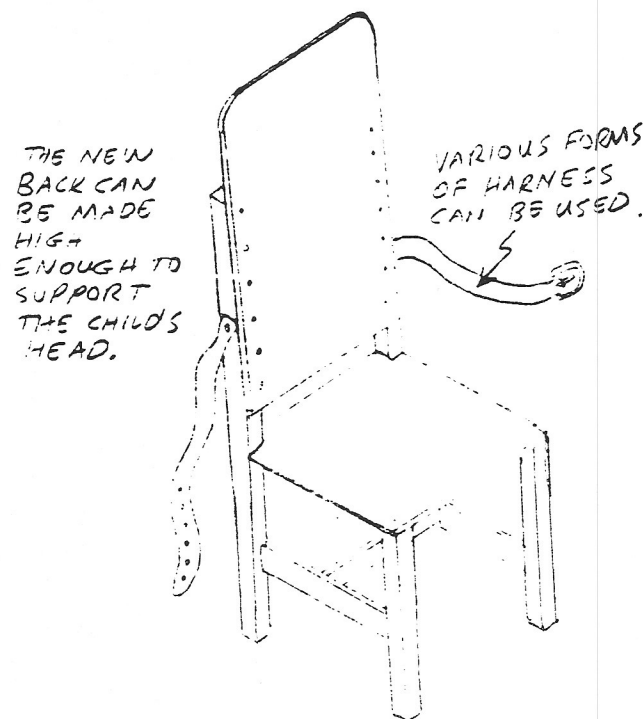
## Back Rest

**Purpose:** Enables child to use modified regular seating rather than purchase a special chair. Can help minimize feelings of being socially different from peers.

**Suggested Uses:** If the child's sitting position is fairly good, a high back may be all the conversion a classroom chair needs. Various forms of harness can be added if more support is required. This conversion can be combined with the skis and foot rest devices described in this manual.

**Materials:** One piece of plywood about 1/4" thick; dimensions according to the width of the chair and the torso height of the child. The height of the new back should be decided with the help of the medical adviser, as well as the type of harness or head support that would be most suitable. Screws or bolts.

**Construction/Design:** After removing all sharp corners and edges, fix the plywood sheet to the chair back. Glue and nail.



**Cautions:** Make sure all rough edges are sanded, all bolts or screws tight, and device is safe and secure.

**Maintenance:** Keep clean and check periodically for rough and/or weak spots in device.

**Reference:** Caston, 1982.



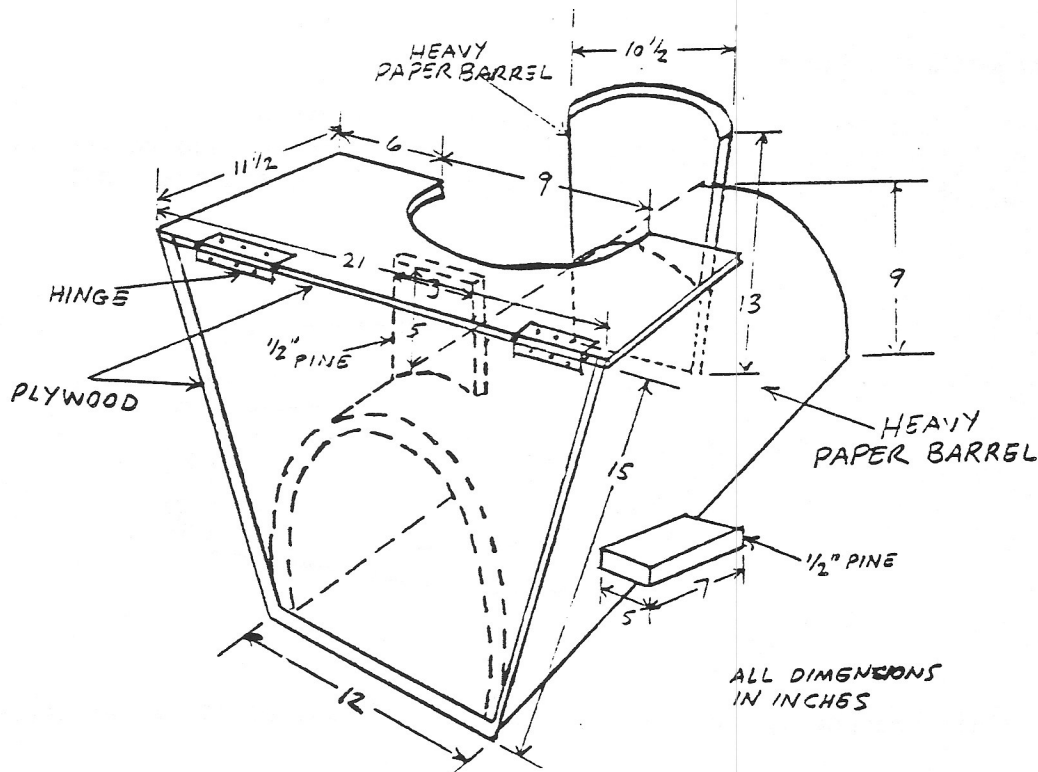
### Barrel Chair with Tray

**Purpose:** Tray provides the necessary balance to enable the child to sit comfortably and securely and offers trunk support while freeing the child's hands for play.

**Suggested Uses:** Chair to abduct legs and maintain balance while permitting user to participate in activities requiring free hands.

**Materials:** Heavy paper barrel, plywood, hinges (1/2").

### Construction/Design:



**Cautions:** Be sure all rough wooden edges have been sanded until they are smooth.

**Maintenance:** Check periodically for rough edges or weaknesses.

**Reference:** The Exceptional Parent, February, 1979.

## Bean-Bag Chair

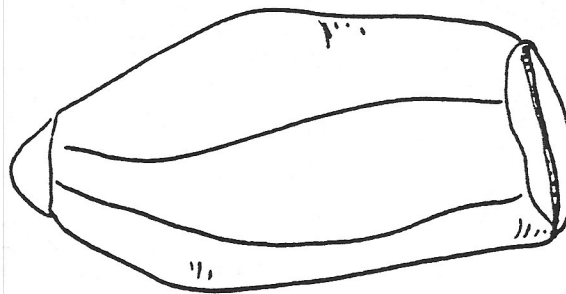
**Purpose:** Gives extra support and provides relaxation to child engaging in a variety of activities. For children under five years old.

**Suggested Uses:** The filling enables parent or teacher to mold chair into desired shape. Placing child in a side-lying position at first may be helpful for children who find it difficult to bring their arms forward in the chair. Useful for times when child is watching T.V., reading a book, or when an adult is playing or conducting therapy with the child.

**Materials:** Polyethylene pellets, foam rubber chips, zipper, strong durable fabric (sailcloth recommended as best of materials compared).

### **Construction/Design:\***

1. Make inner and outer covers out of sailcloth.
2. Put zipper in outer cover so that it can be removed for washing.
3. Fill inner cover with polyethylene pellets and foam chips.



\*This product can usually be bought as cheaply as it can be made.

**Cautions:** Softness of chair makes adjustment of sitting position difficult for child. Use only for severely extended handicapped child who is unable to learn any form of posture control.

**Maintenance:** Keep clean. Maintain cover and an adequate amount of padding.

**Reference:** Finnie, 1974.

## Box Chair

**Purpose:** Straight back of box in combination with sloping angle of seat and narrow sides of box give the child with poor sitting balance sufficient confidence to make additional support or straps unnecessary.

**Suggested Uses:** For young children. May be put on table and be used for feeding to free mother's hands.

**Materials:** Wood for body of chair, padding, man's belt strap and buckle.

### **Construction/Design:**

Different trays can be slotted in for variety in child's play.

Measurements:	Small	Medium	Large
Side Boards (2)			
Length	14 in.	16 in.	18 in.
Height at foot	8 in.	9 in.	11 in.
Height at head	12 in.	16 in.	23 in.
Bottom Board (1)			
Length	14 in.	16 in.	18 in.
Width	9 in.	10 in.	11 in.
Foot Board (1)			
Length	9 in.	10 in.	11 in.
Width	3 in.	4 in.	8 in.
Head Board (1)			
Width	9 in.	10 in.	11 in.
Height	12 in.	16 in.	23 in.

### Putting Box Together:

Side Boards - One is fastened on each side of the bottom board so width of bottom board is inside measurement.

Head Board - Is attached between the side boards at an angle with bottom edge set in 2" to 2-1/2" from back edge of bottom board and is flush or even at the back top edge of side boards.

Foot Board - Is attached between the side boards at an angle with bottom edge set 2" to 2-1/2" in from front edge of side board and 1" to 1-1/2"

up from bottom so there is an air space between foot board and bottom board. Top edge is about 3" down from top edge of side board.

Cut-outs on Side Boards - Are 2" x 5" and are 2" up from bottom edge. Strap and buckle are attached below or at back edge of cut-outs, to go through the openings and fasten child into seat. Also are to let air circulate in and can be used for picking up and carrying box seat.

Corners Inside Box - Each corner is filled in with a board or by cutting a 2/4 piece in half. These are to make corners rounded so shoulders and elbows are held forward.

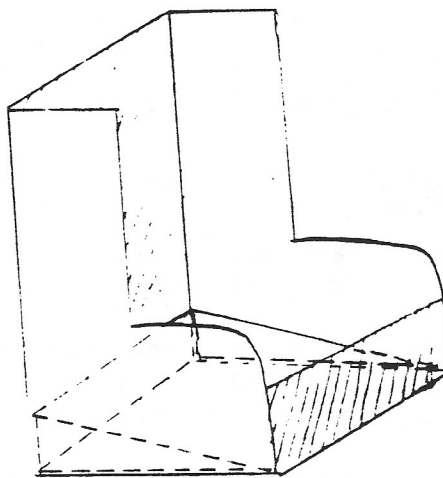
Padding - Pad under knees, seat, and double padding behind head to hold head forward.

Strap and Buckle - A man's belt cut in half. Attach strap end on one side and attach buckle end on the other side.

**Cautions:** Correct angle of seat is essential. Lower back must rest against the support. If the angle is too steep, the base of the child's spine will be rounded; when the child reaches forward, active extension of the back will be impossible. If the child's arms tend to press down when he sits, be sure tray is chest height or tilted. Do not use for a child with poor head control or for a child who is floppy. For a child with asymmetrical patterns of posture, sandbag(s) at hips can help child maintain correct position.

**Maintenance:** Be sure no rough edges are exposed and that joints are secure.

**Reference:** Finnie, 1974.



### Box Support (Variation)

**Purpose:** Supported seating for short-term use for children.

**Suggested Uses:** Child may be seated cross-legged or tailor-fashion inside the box, which gives body support. Quick and safe for short-term use on the lawn, beach, or other recreation areas.

**Materials:** Tall box or plastic wastebasket (suggest heavy, waxed, corrugated boxes used for shipping dressed poultry), masking tape, firm pillow, discarded belts, optional seat cushion.

#### **Construction/Design:**

A tall box or plastic wastebasket may be used for temporary seating. It should be cut down on 2 sides to provide better vision. Masking tape rolled over the cut edges reinforces and protects them. A firm pillow, against which the child leans, is placed in the tall corner. Facing front, the child looks directly out over the cut corner. A heavy, waxed, corrugated box, the kind used for shipping dressed poultry, may be used. Use discarded belts drawn through slits in the sides and base to support the trunk and control the hips and legs of the child. The belts may also be used to strap the seat into a chair. You can adapt a whole box, with a top providing both support and a play table for the very small child, by cutting a triangular piece out of the lid corner to fit the child's chest. A cushion in the bottom can raise the child to the desired height for using his/her arms in relation to the table surface.

**Cautions:** Child supervised at all times.

**Maintenance:** Keep clean.

**Reference:** Robinault, 1973.

## Cardboard Chair and Table

**Purpose:** To provide protective support.

**Suggested Uses:** Can enable a child to engage in a variety of work or play activities.

**Materials:** Rectangular box (2" wider than child's shoulders), seat belt, Elmer's glue, large box for table (2' square), sand or bricks, yardstick, wood strips.

### **Construction/Design:**

1. Prepare seat from rectangular box 2" wider than child's shoulders (to give lateral side support, if necessary).
2. Thread seat belt through second box (seat base or legs).
  - a. Height of base equals child's knee to floor measurement-feet rest flat on floor.
  - b. Boxes may be glued together with Elmer's glue.
3. Table box measures 2 feet square.
  - a. Cut out half circle to fit child. (For suggestions on how to do this, please see directions for Table Attachment, also included in this manual.)
  - b. Table top may be reinforced with yardstick wood strips on underside, if necessary.



**Cautions:** Be sure chair and table are secure and stable.

**Maintenance:** Repair weaknesses in structure as needed.

**Reference:** Author unknown. Rehabilitation Engineering - Seating and Mobility Research.

## Car Seat

**Purpose:** For the moderately disabled child, a special seat insert will provide safe and comfortable support.

**Suggested Uses:** A box selected for use as a footrest can also hold toys for trips.

**Materials:** Wood, 2 hinges, safety belt (from car), foam padding for neck protector, washable vinyl covering for padding (optional), cardboard or wooden box for footrest.

### **Construction/Design:**

For help obtaining correct measurements for a specific child, please refer to Sitting Equipment: General Precautions and Measurements for Special Equipment; included in this manual.

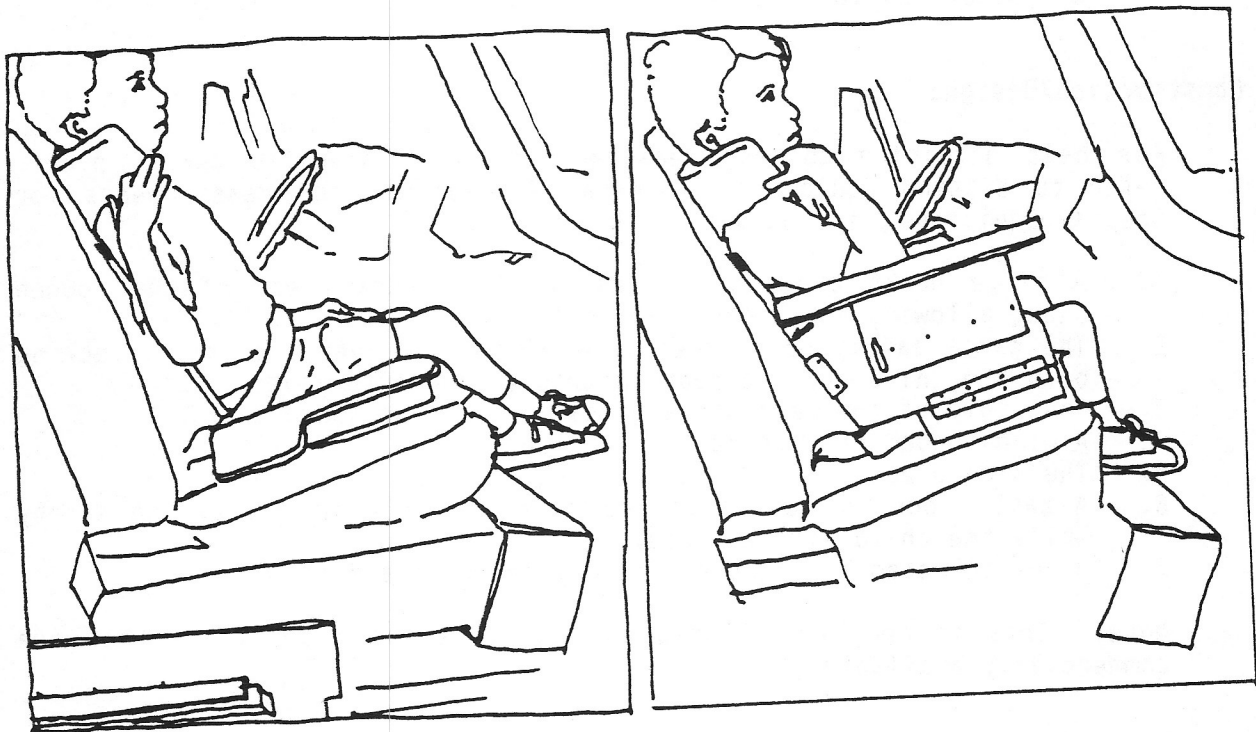
1. A hinge hooks the side pieces to the bottom piece of the wooden seat, allowing the sides to swing down.
2. The car's safety belt comes from behind and over the child, locking both the child and the seat inserts to the auto seat.
3. The angle of the back piece gives a slight backward tilt.
4. A wing-shaped neck protector is padded.
5. The side pieces of the insert swing up.
6. A table locks on the side and back, ensuring stability and safety while the child sits relaxed.
7. A box selected for proper size may serve as a footrest.

**Note:** This is not crash-tested as many safety car seats are that are commercially available.

**Cautions:** The child should not be left in the same position for long periods of time or left alone in the car.

**Maintenance:** Repair loose parts as needed and clean frequently.

**Reference:** Robinault, 1973.





## Chair Trolley

**Purpose:** The chair trolley gives an ordinary chair mobility. It is especially useful to a child who sits well in an ordinary chair but cannot walk.

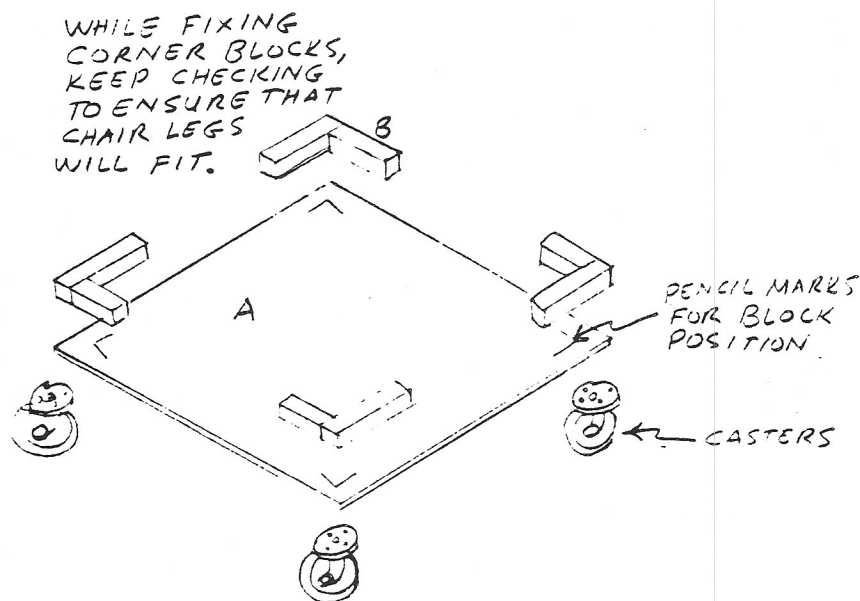
**Suggested Uses:** It may be used at home or at school for a child being "mainstreamed." The board can be lengthened to make a foot rest.

**Materials:** Baseboard: plywood or blockboard about  $\frac{3}{4}$ " thick. To calculate the dimensions, stand the chair to be made mobile on a sheet of paper and mark out the position of each leg with a pencil. Add 2" to the length and breadth measurements thus obtained. Add a further 8" to the length if a foot rest is required. Corner blocks, 8 wanted: softwood 1" x 1" x 3". Casters, 4 wanted.

### **Construction/Design:**

Glue and nail.

1. Stand chair on baseboard A and make pencil marks for the corner block positions.
2. Fix corner blocks B.
3. Screw on a caster at each corner.



**Cautions:** Do not leave child unattended when using this device. Be sure device is fitted to chair with precise measurements to provide safe and secure support.

**Maintenance:** Keep joints clean, wooden edges smooth, and check periodically for any structural weaknesses in device.

**Reference:** Caston, 1982.

## Cylinder Chair

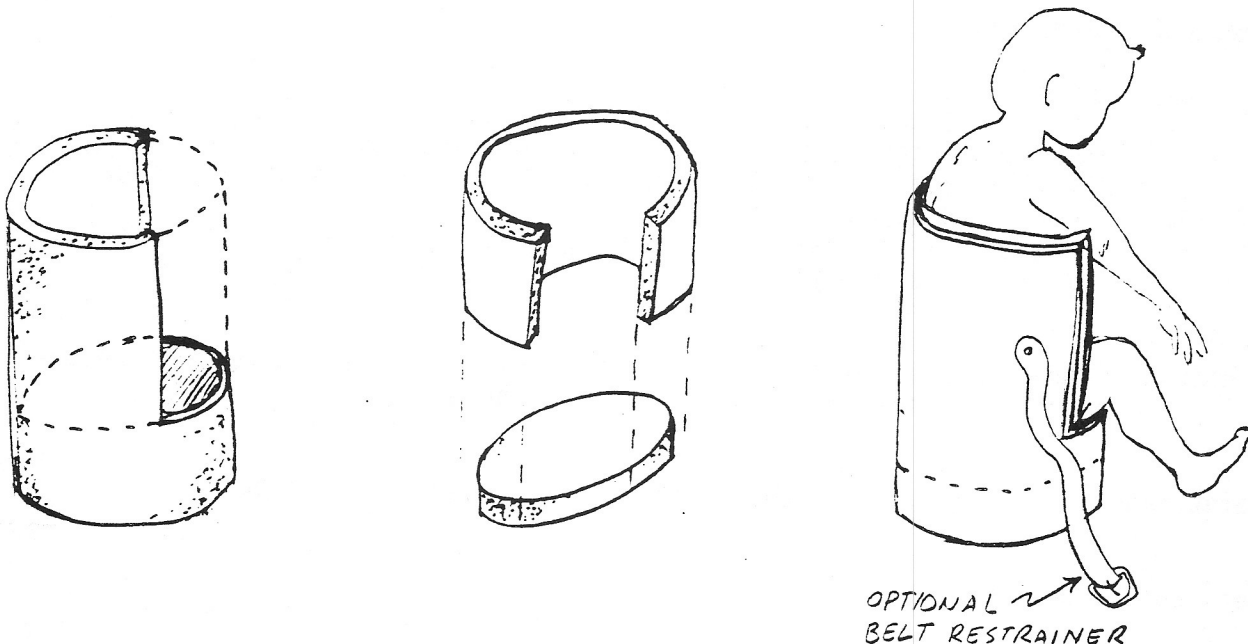
**Purpose:** Provides support and security. Enables child to develop better hand functioning while sitting.

**Suggested Uses:** Useful at mealtimes for child who is apprehensive about using hands. The seat may also be placed on the floor.

**Materials:** Thick, reinforced, cardboard cylinder (made for commercial use), foam padding, washable material, thick disk of reinforced cardboard.

### **Construction/Design:**

The cylinder used for this chair is made of thick reinforced cardboard. With a section cut out, it provides a useful seat, and can be covered with foam and then with a washable material with a foam cushion added to the seat. The seat is made out of a thick disk of reinforced cardboard and provides the necessary stability.



**Cautions:** Don't use unless child has fairly good balance; may tip.

**Maintenance:** Keep clean. Repair parts that are worn or loose.

**Reference:** Finnie, 1974.

## Floor Corner Seat

**Purpose:** Useful for improving head and trunk control, increasing intracostal breathing, and assisting in acquisition of visual-motor coordination. Can give stability and security to a child who has poor balance when sitting on the floor.

**Suggested Uses:** In hot rooms or weather, the angular shape of this chair allows free passage of air over the back, thus allowing the child to sit more comfortably; to provide balance when child/user needs to use his arms and hands for activities.

### **Materials:**

Base: plywood 1/2" x 21" x 24"  
Sides, 2: plywood 1/2" x 16" x 16"  
Side base battens, 2: softwood 1" x 1" x 16"  
Side upright batten: softwood 1" x 1" x 16"

### **Construction/Design:**

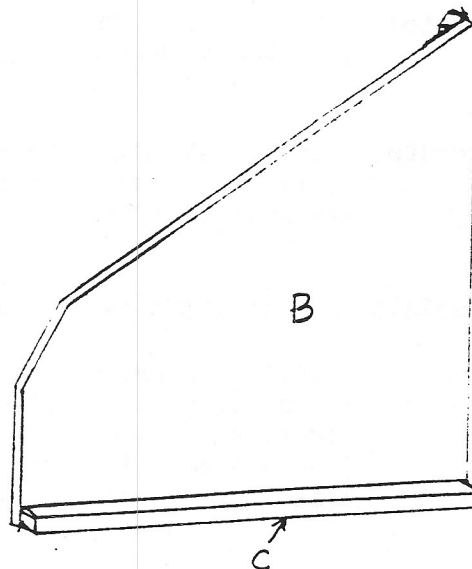
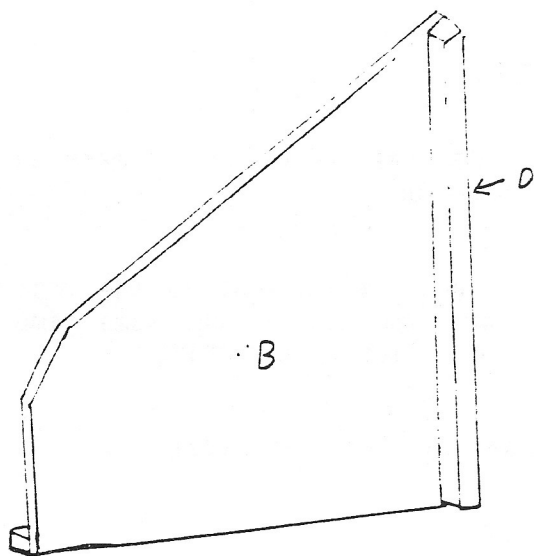
Glue and nail.

1. Cut sides B to shape as shown in drawing.
2. Fix side upright batten D to one of the sides B.
3. Fix side base battens C to the sides B (see diagram on next page).
4. Fix sides B together at 90°.
5. Fix sides B to base A so as to give a 3" space at the back (see diagram on next page).

**Cautions:** Never leave child unattended in chair. Be sure device is secure and that there are no rough spots or loose nails.

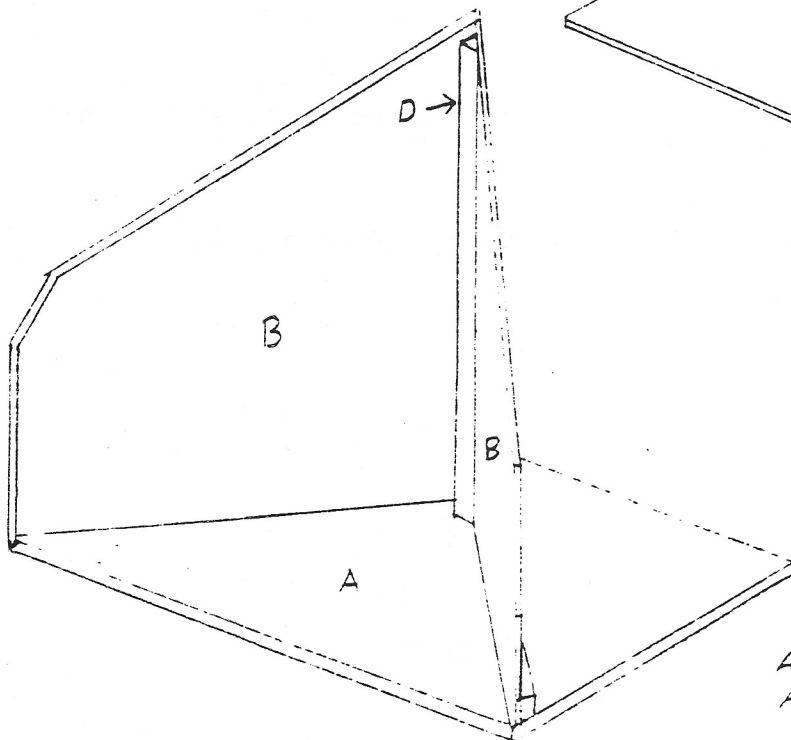
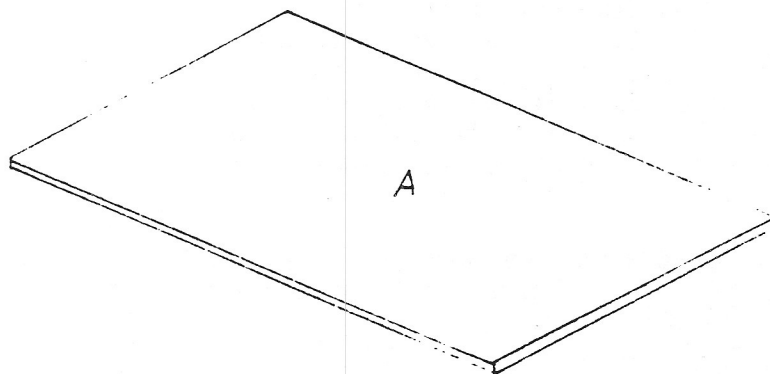
**Maintenance:** Regularly clean and check for weaknesses in structure.

**Reference:** Caston, 1982.



THE DRAWINGS ARE NOT IN  
ISOMETRIC PROJECTION

SAND ALL SHARP  
CORNERS AND EDGES



FOR A VERY ACTIVE CHILD,  
MAKE THE BASE (A) 3"  
DEEPER TO GIVE MORE STABILITY

ASSEMBLE SIDES (B) TO BASE (A)  
AT 90°

## Foot Rest Boxes

**Purpose:** To keep feet on a foot rest it is sometimes necessary to make an attachment that will maintain their position.

**Suggested Uses:** Ask your therapist to decide which attachment is the most suitable for the child's particular problem, and at the same time ask what size to make. The length of the foot is important.

**Materials:** Guide sizes only. May be constructed in different sizes.

Ends, 4: plywood 1/4" x 3" x 3"  
End battens, 8: softwood 1" x 1" x 3"  
Sides, 4: plywood 1/4" x 3" x 6"  
Side battens, 4: softwood 1" x 1" x 6"  
Base (if required): plywood 1/4" x 6" x 13"

### **Construction/Design:**

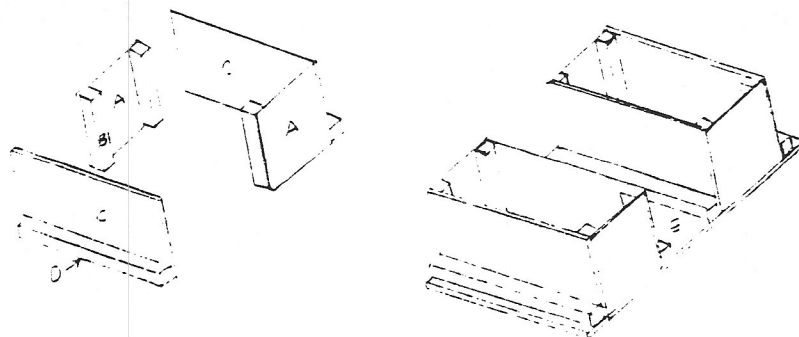
Glue and nail.

1. Fix battens B to ends A.
2. Fix battens D to sides C.
3. Fix end battens B to sides C.
4. Fix the assembled boxes to base E, or existing foot rest, at the correct distance apart.

**Cautions:** Be sure all rough edges have been sanded until smooth and that there are no protruding nails.

**Maintenance:** Keep clean. Reglue or nail if necessary for stability.

**Reference:** Caston, 1982.



### Gad-About Chair with Adjustable Table

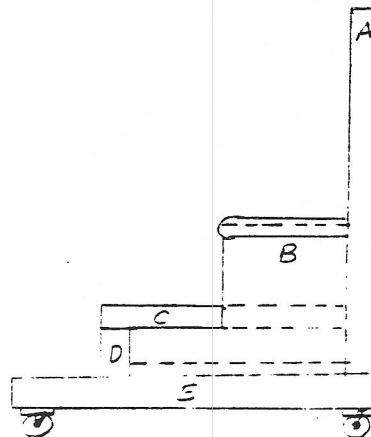
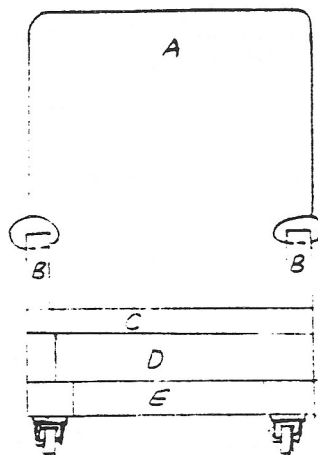
**Purpose:** Facilitates a change of environment, promotes increased opportunities for learning, and provides protective support.

**Suggested Uses:** Any time supportive seating is required.

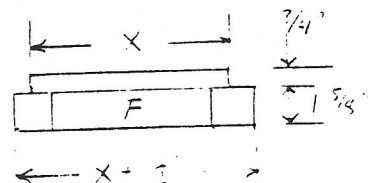
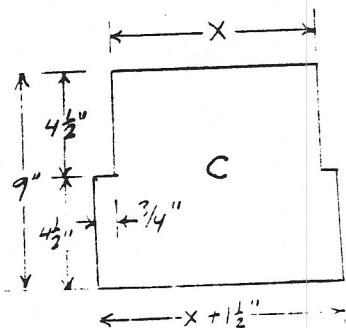
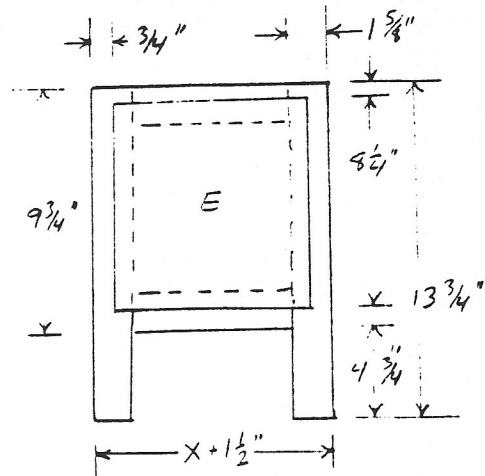
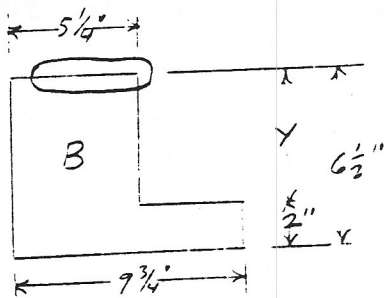
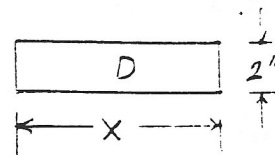
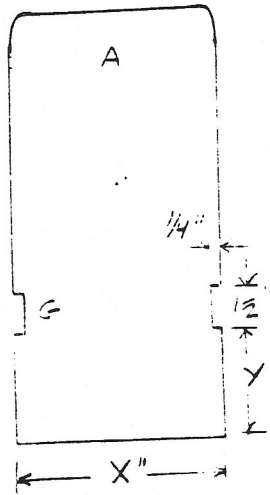
**Materials:** 3/4" weatherproof plywood for all chair parts, 2" by 2" wood for base frame, 1" sponge rubber, plastic upholstering material, casters (Colson No. 37253 or equivalent) and/or 3" rubber tires that can swivel.

#### **Construction/Design:**

1. The back height can be made to suit the rider or the pusher.
2. Use 3/4" weatherproof plywood for all chair parts.
3. Use 2" x 2" wood for base frame.
4. Cover chair arms with sponge rubber, 1" thick, and plastic upholstering material for comfort and cleanliness.
5. Use casters large enough for easy mobility (Colson No. 372353 or equivalent or 3" rubber tires that can swivel).
6. Use weatherproof wood and round all corners and edges.



NOTE: CHAIR WILL HAVE TO BE  
BUILT TO THE INDIVIDUAL  
CHILD'S MEASUREMENTS.





**Cautions:** Be sure no rough edges or protruding nails are exposed.

**Maintenance:** Maintain moving parts (regularly oil wheels/casters). Keep clean and periodically tighten loose joints.

**Reference:** Robinault, 1973.

## Inflatable Chairs

**Purpose:** Comfortable, supportive, alternative seating devices.

**Suggested Uses:** Small and light, these chairs can be placed in an armchair or baby carriage. Useful for feeding times or when playing with child. Canvas can also be stretched over an inflated tube to create a seat.

**Materials:** If you look around in stores, you will see inflatable chairs in shapes such as a triangle and a round seat for small children.

**Construction/Design:** None.

**Cautions:** These chairs are suitable for small children only. As these chairs are generally quite light, for safety they should only be placed where there is additional stable support.

**Maintenance:** Clean periodically. Keep inflated to desired level.

**Reference:** Finnie, 1974.

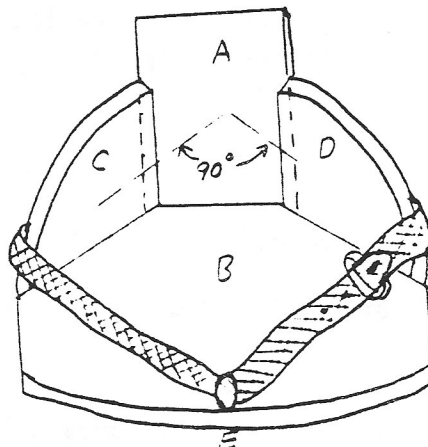
### Knickerbocker Corner Seat

**Purpose:** Provides alternative supportive seating options.

**Suggested Uses:** For a change in position, child can sit in seat with legs straight out.

**Materials:** 3/4" wood; back (A), 7-1/2" by 12"; base (B), 14-1/2" by 18- 1/2"; sides (C, D), 7" by 9" each; webbing from sides to point E on base.

**Construction/Design:**



**Cautions:** Be certain no rough edges are exposed.

**Maintenance:** Keep clean, be alert to any weak joints in device while being used.

**Reference:** Robinault, 1973.

## Raised Corner Seat

**Purpose:** Useful for improving head and trunk control, increasing intracostal breathing, and assisting in acquisition of visual-motor coordination.

**Suggested Uses:** This corner seat is the same as the corner floor seat, except that it is raised off the ground on two plywood panels. The height of these panels must be decided on by measuring the child. A pommel between the legs may be suggested if the child tends to slip out of the chair, and it may also help to hold tight knees apart.

### **Materials:**

Side panels, 2: plywood 1/2" x 21" x seat height to suit child  
Battens, 2: softwood 1-1/2" x 1-1/2" x 21"

**Important:** For a heavy and active child, a bracing cross panel between the side panels is necessary.

### **Construction/Design:**

Glue and nail.

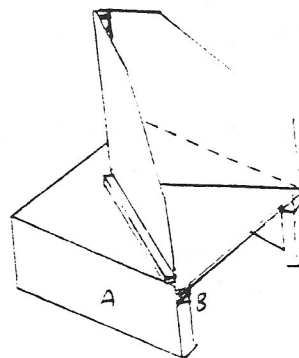
To fit sides to make raised corner seat:

1. Fix battens B to sides A.
2. Fix sides A to base of floor corner seat. Make floor corner seat as described earlier.

**Cautions:** Be sure there are no rough spots, protruding nails, or structural weaknesses in this device as any one of these could cause injury to the child.

**Maintenance:** Frequently clean device and check to be sure it is safe.

**Reference:** Caston, 1982.



ADD A PIECE OF WOOD  
ACROSS FRONT TO STOP  
CHILD'S LEGS FROM  
SLIPPING UNDERNEATH

## Raisers for Beds, Tables, and Some Chairs

**Purpose:** Two different designs raise furniture higher in order to adapt it to the handicapped child's needs.

**Suggested Uses:** The first design is suitable only for wooden furniture because the raiser has to be screwed to the leg. The second one can be used with both wood and metal legs. The latter are not fixed to the legs, so they can be taken away from the home - on vacation, for instance - to adapt the furniture your child may need to use. Round, square, wood, or metal legged tables and beds as well as some chairs can be raised with these raising blocks.

### **Materials:**

#### Design 1

For each raiser - four raisers to a set:  
Side: plywood  $3/8$ " x measure of leg + 1" x 6"  
Batten: softwood 1" x 1" x 6"  
Side: plywood  $3/8$ " x measure of leg x 6"

#### Design 2

For each raiser - four raisers to a set:  
Sides, 4: softwood 4" x 6" x  $5/8$ "  
Base, 1: plywood  $1/4$ " x  $5-1/8$ " x 4"  
Raisers: a number of pieces of wood that will fit inside the box enable you to make adjustments in the height

### **Construction/Design:**

Glue and nail.

#### Design 1

1. Fix batten B to side A.
2. Fix side C to batten B (see drawing that follows).
3. Fix assembled raisers to the legs of the furniture. The advantage of this design is that the raiser can be fixed to the inside of the leg.

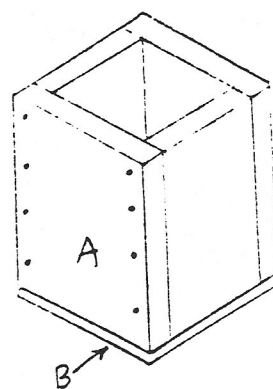
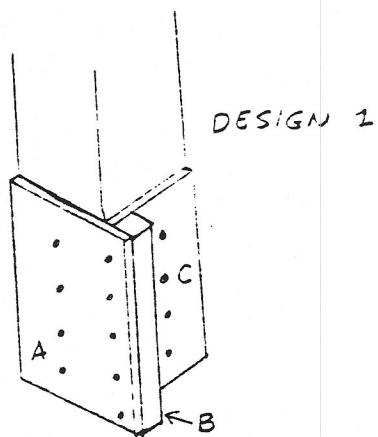
#### Design 2

1. Fix sides A together.
2. Fix base B to assembled sides A.
3. Cut a number of pieces of wood to make raisers C.

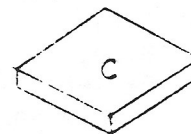
**Cautions:** As any weaknesses in the construction or fit of these raisers could potentially cause injury to the child, be sure structures are strong and well fitted to furniture they are used with.

**Maintenance:** Check often for loose spots and/or protruding nails.

**Reference:** Caston, 1982.



DESIGN 2



WOODEN BLOCKS OR  
RISERS ARE PLACED  
IN THE BOX

MEASURE THE LEGS TO  
MAKE SURE THAT THEY  
FIT IN THE BOX. ADJUST  
IF NECESSARY.

## Rocker

**Purpose:** Useful for the development of proprioception and for balance training.

**Suggested Uses:** Useful for seating individual and also for sessions to work on balance.

**Materials:** Firm pillow, apple crate, hammer, small finishing nails, saw.

### **Construction/Design:**

Rocker is made from a cut-down apple crate. A pillow is used to fill in space and give back support. The user sits cross-legged. The apple crate is cut across all four corners of the base and the bottom slats are removed and then renailed on where the bottom corners are cut diagonally at a 45° angle.

**Cautions:** Child should be supervised at all times when in the rocker. Not for heavy users.

**Maintenance:** Be certain joints are secure and nails do not come loose.

**Reference:** Robinault, 1973.



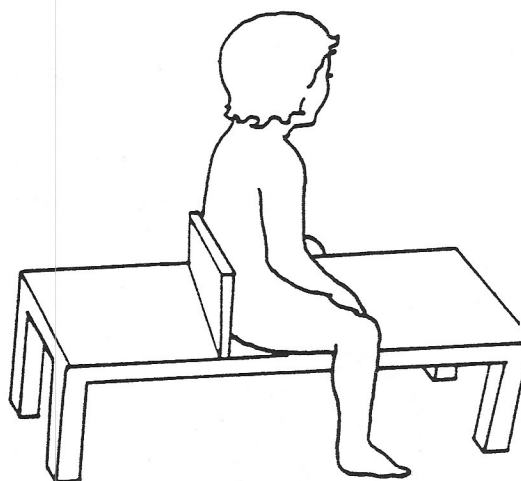
## Sawhorse Bench

**Purpose:** Aids the sitting balance of a child who tends to sit with his legs pulled together. By straddling the bench, the child's legs are abducted and externally rotated. This provides a wider base of support that increases trunk stability.

**Suggested Uses:** The child should be properly positioned on the sawhorse bench. Symmetrical alignment, adequate hip flexion, and a straight spine should be encouraged. A short backrest can be provided.

**Materials:** 3/4" plywood for chair or bench.

**Construction/Design:** Correct height of the bench can be obtained by measuring from below the knee flexed at 90 degrees to the sole of the foot.



**Cautions:** If trunk control is precarious, child should not be left unattended on the bench. Be sure no rough spots and/or protruding nails are exposed.

**Maintenance:** Keep clean. Repair loose joints as needed.

**Reference:** Connor, 1978.



## Sit-Up Seats

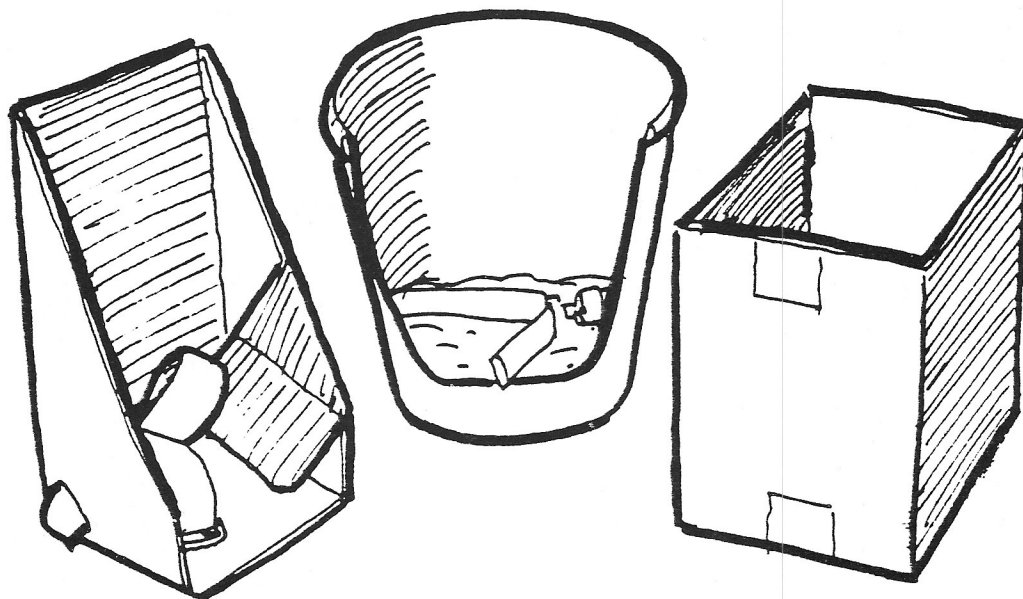
**Purpose:** To provide body-trunk support and to shorten seat depths for little people.

**Suggested Uses:** Can be useful when used alone or strapped to larger chairs.

**Materials:** Rectangular cardboard box, plastic wastebasket, cardboard box, plywood (modeled after cardboard box), seat belt, glue, sponge wedge (4" front to 2" back), padding (optional), plastic upholstering material (optional), Velcro (optional).

### **Construction/Design:**

1. A rectangular cardboard box (glued together), cut and folded to make a seat, with a seat belt added can be used.
2. A plastic wastebasket (8" diameter base) can be cut out to make a "barrel-back chair" for floor, tub, bed, etc.
  - a. A sponge wedge 4" front to 2" back to aid hip flexion for sitting can be added if helpful.
  - b. A seat belt can be threaded through base of basket.
3. A rectangular box for box seat may enhance sensory awareness of space, balance, movement, touch, sound, visual, and social contact.
4. Padding can be covered with sturdy, washable fabric and attached where necessary with Velcro strips.



**Cautions:** Be sure no rough plastic edges are exposed and that device provides necessary support for the weight of the child.

**Maintenance:** Be alert to any weaknesses in the seats and replace as necessary.

**Reference:** Nathan, 1970.

## Skis and Foot Rest

**Purpose:** It is important for the handicapped child to use as much standard equipment as possible. Modifying an ordinary school chair to suit the child's needs instead of buying a special chair is sometimes an ideal solution to a possible seating problem.

**Suggested Uses:** If the child's sitting position and balance are reasonably good, only skis and a foot rest may be needed to stabilize the chair. A harness may also be fitted if necessary.

### **Materials:**

Skis, 2: 3/4" x 1-1/2"  
Foot rest: 1/4" plywood  
Screws or bolts

### **Construction/Design:**

Glue and nail.

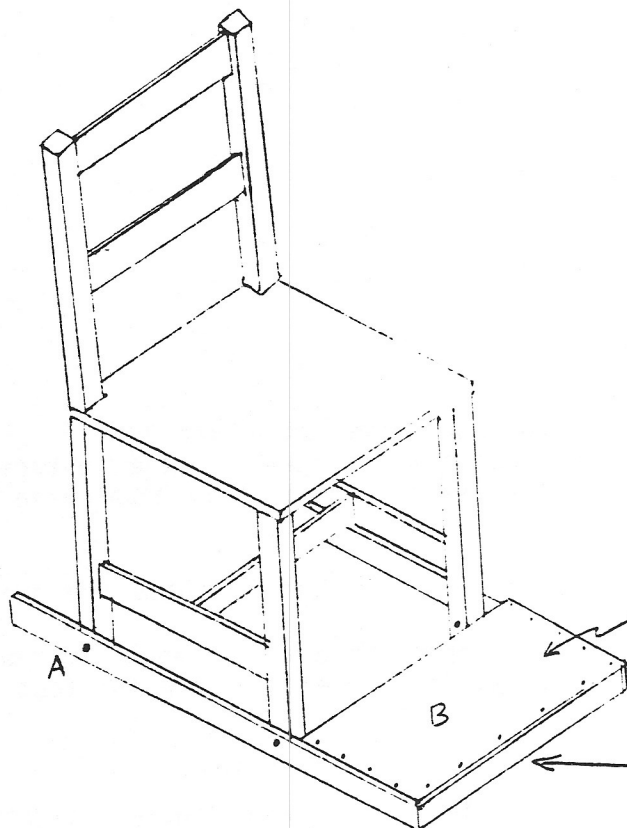
There are so many different sizes and shapes of chair that it is not possible to prescribe dimensions, which will depend on the measurements of the chair. Make the length of the skis approximately double the depth of the chair.

1. Cut 2 skis from length of batten, approximately twice the depth of the chair.
2. Cut foot rest, width of chair x approximately 2 x length of foot.
3. Screw or bolt skis to chair legs, leaving enough room for foot rest.
4. Fix foot rest to skis.

**Cautions:** Be sure all rough edges are sanded, bolts or screws are tight, and that device is safe and secure.

**Maintenance:** Check periodically for rough and/or weak spots in device.

**Reference:** Caston, 1982.



A PIECE OF PLYWOOD  
IS USED FOR THE  
FOOT REST

IF ONLY THIN PLYWOOD  
IS AVAILABLE, A THIRD  
BATTEN MUST BE NAILED  
AND GLUED TO FRONT.

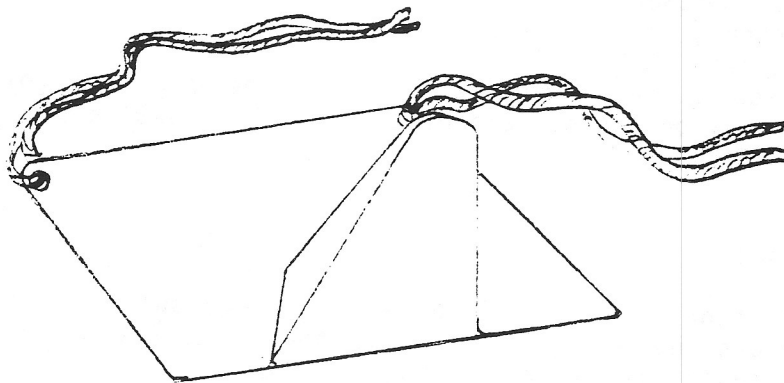
### Ty-D-Saddle

**Purpose:** A high chair safety seat and leg abductor.

**Suggested Uses:** To prevent child from sliding out of high chair.

**Design:**

Commercial design - Cost: \$6.00 for one saddle  
\$39.00 for one dozen saddles



**Cautions:** Never leave child unattended while in this device.

**Maintenance:** Keep clean.

**Reference:** Ty-D-Saddle.

## Working Table

**Purpose:** A strong, rigid working table is often needed, both at school and at home, for the handicapped child to engage in a variety of table-top activities. This design can take many hard knocks and still provide years of service.

**Suggested Uses:** Any time table top is needed.

### **Materials:**

Top: plywood 3/8"  
Legs, 4: softwood 2" x 2"  
Side battens, 2: 5/8" x 3"  
Front batten: 5/8" x 3"  
Short back battens (required only if the child is going to press very heavily on the corners of the cutout): 5/8" x 3"  
Screws: 5/8"

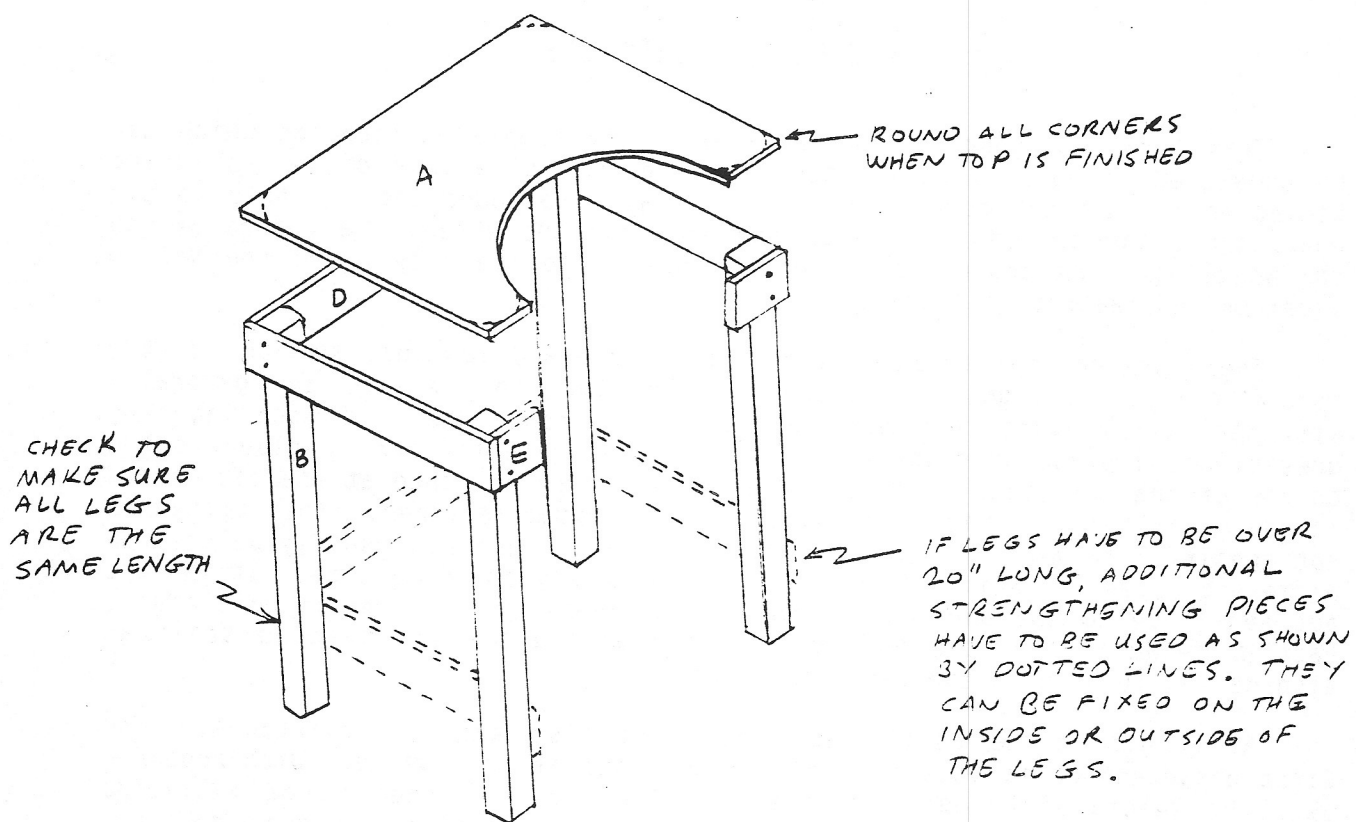
### **Construction/Design:**

1. Screw battens C, D, and E to legs B. Make sure that the top edges of the battens are all level so that the top will touch them everywhere to make a good gluing surface.
2. Make cutout in top A.
3. Screw top A to assembled legs, and make sure that dimensions are correct.
4. Glue assembled legs B.
5. Glue top A to assembled legs B, and place heavy weights on top until glue is dry.

**Cautions:** Be certain device is safe and secure. Check for rough edges and/or loose bolts or screws.

**Maintenance:** Clean regularly and frequently check table for structural weaknesses.

**Reference:** Caston, 1982.



## Suggestions for Mounting Lap Trays and Communication Boards to Wheelchairs

**Purpose:** Seldom will one single lap tray or communication board be able to meet the needs of a handicapped individual. The solution to the need for several different types of lap trays or boards is not compromise (i.e., a middle-sized board). In order to develop the means to use several communication boards or lap trays interchangeably, two methods for mounting lap trays to wheelchairs are presented. The mounting ideas here were chosen because they require no modifications to the wheelchair itself and can be easily made using common tools and parts obtained from most hardware or department stores.

### Mounting with Velcro Tape

This first mounting system is an extremely simple application which can be completed in about five minutes. It consists of a pair of Velcro straps tacked to the armrest portion of the lap tray. To mount the lap tray to the wheelchair, the tray is placed on the arms and the straps are looped around the wheelchair and brought back to the top of the lap tray where the Velcro overlaps and fastens to itself.

There are several advantages to this simple and low cost system. If the straps are pulled tight, the board is held tight to the arms and generally will not pull forward if someone pulls on the front edge. (If the lap tray does slide, a piece of rubber or other friction material can be glued to the bottom of the armrests.) Because the tray is only attached at the back edge, it can be tilted up, which facilitates use for some children. This system is not sensitive to minor changes in wheelchair width and can usually be used on different types of chairs if they are approximately the same size. It is also not sensitive to the particular kind of thickness of the armrest on a chair. Lastly, because there are no protrusions from the bottom, the lap tray can also be easily used on the table or floor.

Along with these advantages, there are also some disadvantages. The first disadvantage is that it tends to wear out after a while. With repeated use, the Velcro will begin to lose its grip and will need to be replaced. This replacement can be significantly delayed by obtaining a good quality, long-life Velcro.

The second disadvantage to this approach is that it takes slightly longer to attach to the wheelchair. Although it only involves two flicks of the wrist, this requires more effort than the second mounting approach (see Mounting with Wooden Runners) which simply involves sliding the lap tray on.

Finally, the tilt-up feature of this board can be a problem at meal time. A good rap on the bottom of the board by the child's knee could send dishes

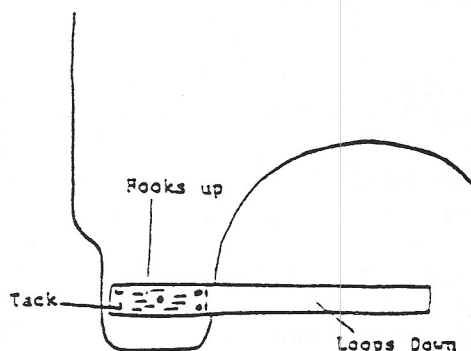


and their contents into the air. If this is a problem, an extra strap or hook could be put on the front of the aid to keep it from tilting up.

**Materials:** Two 12" strips of Velcro "loop" material, two 4" strips of Velcro "hook" material, 10 small tacks, 1 tack hammer.

**Construction:**

1. To assemble the mounting system, put one 2-1/2" strip of Velcro loop material (loops down) on the armrest of the lap tray. One end should be on the tray's armrest with the rest hanging into the cutout (see figure).
2. Now place a 2-1/2" strip of Velcro hook material (hooks up) on top of the other Velcro strip. You should now have two strips of Velcro, back-to-back on the arm with the bottom one sticking out (loops down). The top piece should have the hooks up. Now pound a tack into each corner of the small strip of Velcro as well as one tack in the center (see figure). Now repeat for the other side. When finished, the two Velcro straps should both hang down in the middle of the cutout.
3. To mount the lap tray to the wheelchair, simply wrap the strap around the arm and press it down on the Velcro hooks (see figure). If the strap is too long, it can be cut back, but be careful. If it is cut too short, the Velcro hooks will be exposed and may catch in clothing or irritate the child's arm. A helpful hint from veteran Velcro users is to cut the loops off the last 1/4" or so of the long straps or to put a 1/4" strip of hooks over them. This gives you something to grip when trying to pull the Velcro loose to remove the tray.



Place Velcro loop strip face down on lap tray arm.  
Place Velcro hooks face up on loop strip. Drive in  
tacks - keep corner tacks very near the corners.

**Cautions:** Watch for rough edges and splintering wood.

**Maintenance:** Wash weekly or whenever necessary.

## Mounting with Wooden Runners

Another mounting system consists of two wooden runners on the bottom of the lap tray which slide next to the wheelchair arms. The lap tray is mounted on the wheelchair by simply sliding it on.

The advantages of this system are chiefly its convenience and durability. Mounting is a simple one-motion effort. The system is rugged and has no components which wear out. There is also no problem with the tray flipping up if struck from below with a knee.

The major disadvantage of this mounting is that it is more sensitive to variations in wheelchair arm separation and thickness. A second disadvantage of this mounting system is that the board tends to slide off as easily as it slides on. If the child moves around a lot in his chair, or if others pull on the lap tray to move the board, a problem may arise. It can be solved by any of these three simple methods:

1. Put a strap around the back of the chair which connects on either side of the lap tray.
2. Put a smaller strap on one side of the lap tray which goes around just one of the backposts.
3. Set up a "hook and eye" arrangement at the back of the chair. The lap tray would have a strap with a "hook" and the back of the chair would have the "eye." This arrangement could be on one or both sides of the wheelchair (see figure).

Another disadvantage of this approach is that the wooden tracks protrude from the bottom and make it less convenient to use on a table top or the floor. Finally, this system may not be compatible with power wheelchairs.

**Materials:** Two boards 12" x 1-1/2" x 1-1/2" (for 1" thick arms), two plywood pieces 12" x 2-1/4" x 3/8", four flathead bolts 2-1/4" x 1/4", four washers, four nuts, two C-clamps (or wood clamps), one 3/8" drill bit for hand or electric drill, one adjustable wrench or pair of pliers.

For this mounting system, the lap tray need not have armrests cut out. If there are no armrests, however, the lap tray must be prevented from possible movement back too far against the child. Blocks should be bolted to the bottom of the tray in front of the wheelchair arm. Care should be taken to position the tray properly for the child's use before the blocks are installed.

If protection against the tray sliding forward or being pulled off is desired, you will also need the following materials (see figure):

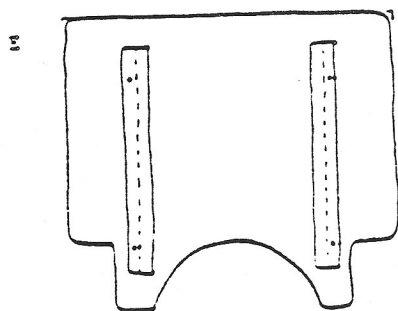
- (a) two hooks (dog leash style), two eyes, and a strap (determine strap length after you choose one of the designs in figure).
- or (b) a simple "hook and eye." Use a bolt-type hook.

## Construction:

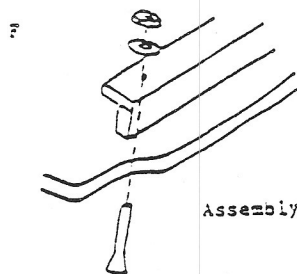
For convenience, the following procedure can be used for constructing/positioning the wooden runners on the lap tray (refer to figure).

1. Measure the distance between the outside edges of the wheelchair arms (see figure). Be sure the child is seated normally in the chair.
2. Add  $1/2"$  to this measurement and call it "B."
3. Place the two smaller pieces of wood on the lap tray as shown in figure.
4. Place the flat boards (plywood) on top as shown in figure.
5. Check to be sure that the distance "C" is equal to the thickness of the wheelchair arm plus  $1/8"$ .
6. Clamp these pieces of wood to the lap tray. Recheck your measurements ("B" and "C") for accuracy.
7. Drill two  $3/8"$  holes through the properly positioned pieces and the lap tray as shown in figure. Drill slowly to avoid splintering lap tray top when the drill breaks through.
8. Insert the bolts and pull them through the holes. Put nuts onto ends of bolts and tighten down until bolt heads are even with surface (flush with top).

When the aid is completed, sand and round all edges. Coat with polyurethane or other suitable finish.



Drill Holes

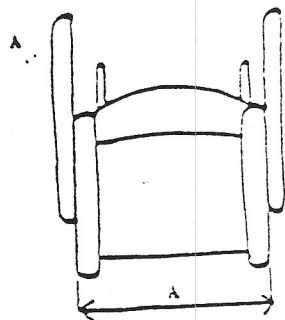


Assembly

A = Distance Between Outside Edges of Wheelchair Arms.

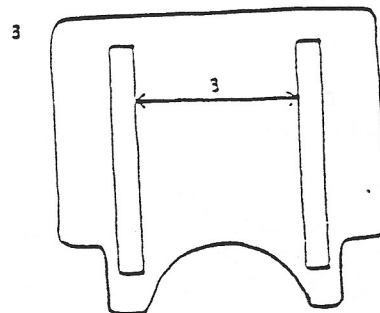
B =  $(A + 1/2")$  Distance Between Two "Runners" Positioned on the Underside of the Laptray.

C = Distance from Underside of Laptray to Underside of Runner (this Distance Must Be Equal to the Thickness of the Wheelchair Arm Plus  $1/8"$ )



$$(A + 1/2" = 3)$$

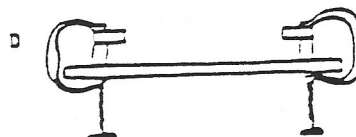
Wheelchair Arm Measurement  
from Outside Edges



Bottom View of Laptray  
with "Runners" Positioned



Upside Down,  
Front View of Laptray



C - Clamps Holding "Runners"  
in Place for Drilling Process

**Cautions:** Watch for rough edges and splintering wood.

**Maintenance:** Wash weekly or whenever necessary.

**Variations:** In addition, either a C-clamp or Velcro can be used to mount adaptive switches onto a wheelchair tray or lap tray. If using Velcro, hot glue the Velcro strips to the tray and to the switch. This way the switches can be interchanged.

**Reference:** Vanderheiden, 1980.

### Abduction Spreader (Butterfly)

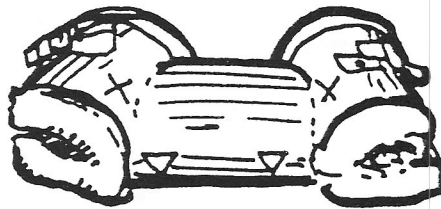
**Purpose:** Encourages positioning of the legs away from the body's midline.

**Suggested Uses:** Correct positioning across a variety of settings.

**Materials:** Plastic surgical non-allergic sponge or less expensive and more easily available lamb's wool, flat shoelaces (found in stores that sell buffing machines), plastic bottle (tall, cylinder-shaped), hot ice pick.

#### **Construction/Design:**

1. A doctor can determine the number of inches spread between the knees.
2. Place pattern on bottle (see pattern that follows).
3. Place narrow side toward body; wide span will then be toward knees (see pattern).
4. The wings overlay thigh cuffs.
5. Pierce dots with hot ice pick through both wings and spreader plastic.
6. Use flat shoe lace through holes (cross stitch fashion) to hold cuff and spreader together. Each cuff will be laced at the top and bottom to the two wings.

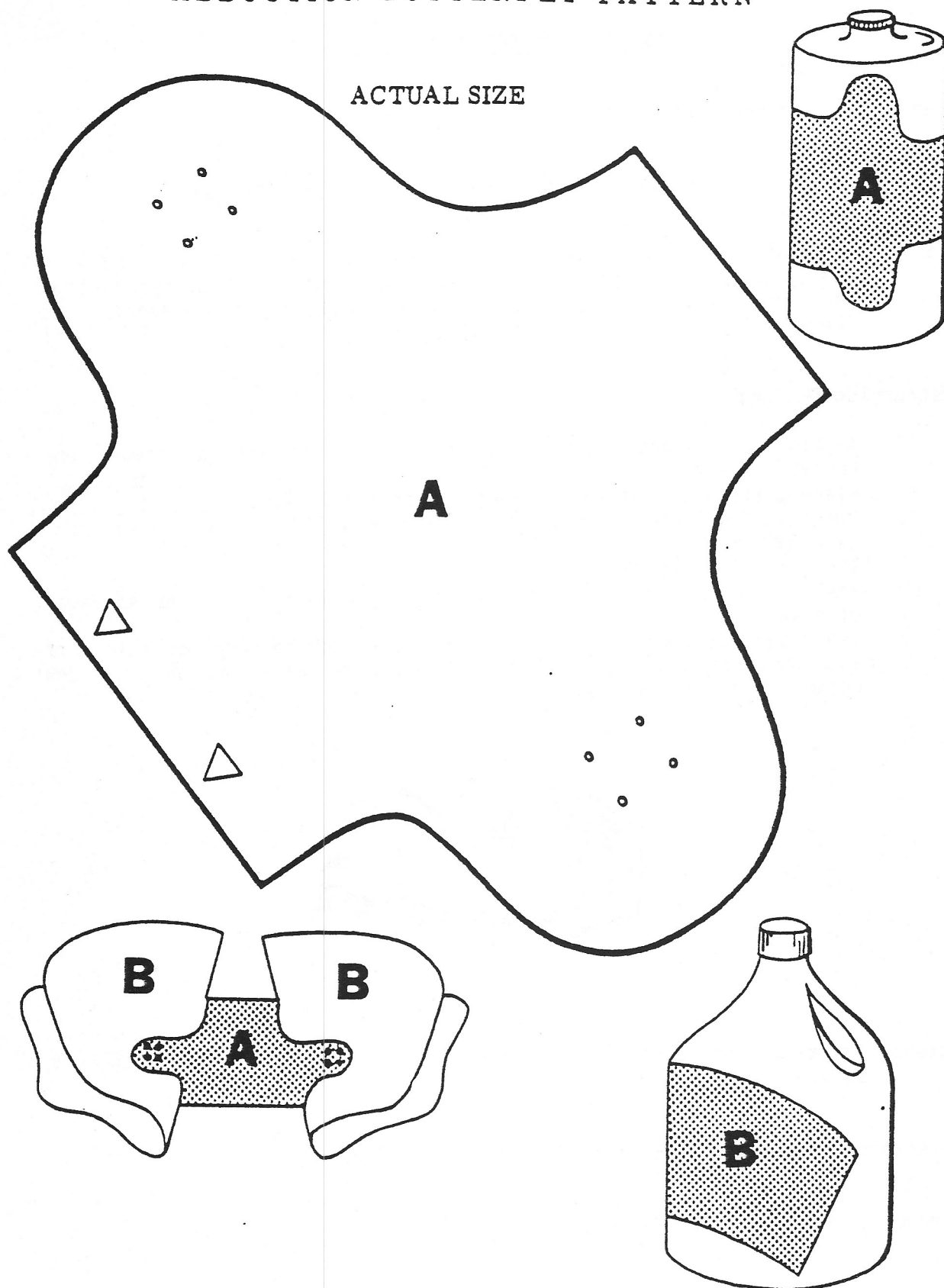


**Cautions:** Make sure no rough plastic edges come into contact with the child's skin.

**Maintenance:** Replace device as holes wear out with use.

**References:** Finnie, 1974; Nathan, 1970.

# ABDUCTION BUTTERFLY PATTERN



## Cloth Helmet

**Purpose:** Protection from further injury if child falls; lightweight.

**Suggested Uses:** Use whenever child is exposed to situations where he may lose balance and fall.

**Materials:** Webbed elastic; 8 strips of 1-1/4" elastic cut 2" long; 4 strips of 1-1/4" elastic cut 1" long; calico, denim, or other moderately heavy cotton (2 pieces for front and 2 pieces for back); sponge padding.

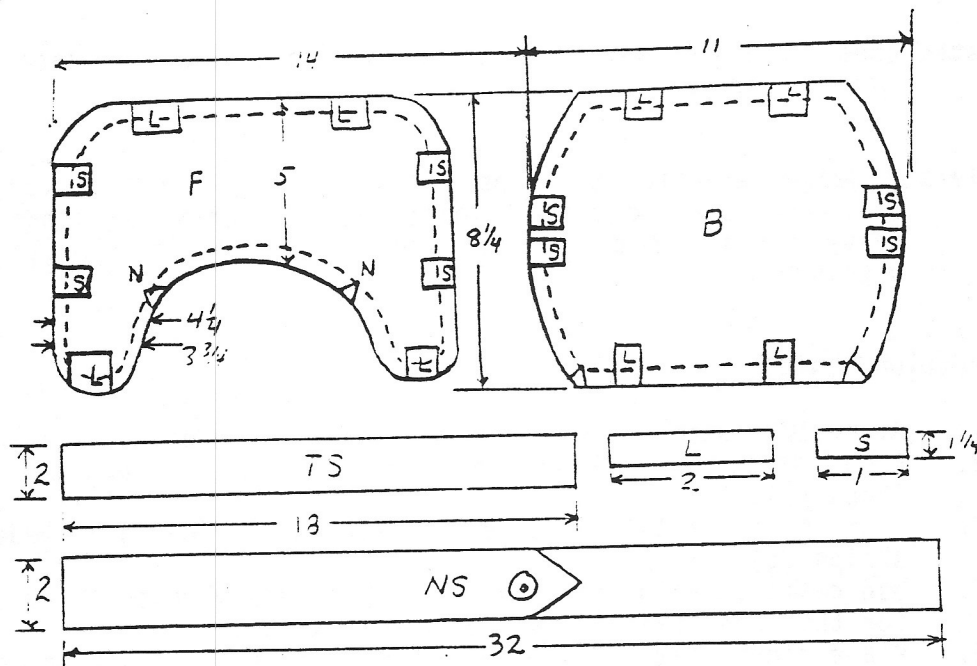
### **Construction/Design:**

1. Allow 1/2" seam allowance on all pieces, including elastic.
2. Eight strips of 1-1/4" webbed elastic cut 2" long are needed for loops (L).
3. Four strips of 1-1/4" webbed elastic cut 1" long are needed for side strips (S).
4. Use calico, denim, or other moderately heavy cotton. Cut two pieces for the front (F) and two for the back (B).
5. Place right sides of the two front pieces (F) together and pin ends of the 2" elastic to form loops (L) between the two surfaces. Pin one end of 1" side elastic (S) between the two surfaces.
6. Cut sponge padding, one piece to pattern of front piece (F) to fit inside dotted seam allowance.
7. Sew around front (F) pieces, leaving area between notches (N-N) open so that sponge can be added. Turn and press. After sponge padding has been added, turn in remaining seam allowance and top stitch between notches.
8. Place right sides of back pieces (B) together and pin ends of 2" elastic to form loops (L), just as with front, but wait until sponge has been inserted to sew in the two back neck loops.
9. Sew around back pieces (B), leaving area between notches (N-N) open and area of side strips (S) open. Turn and press.
10. Insert side strips of front (F) into areas for back side strips, turn in seam allowance, and top stitch back (B) over side strips. Insert sponge padding, turn in seam allowance, and pin in neck loops. Top stitch.
11. Cut two straps, one for the top (TS) and one for the neck (NS). Fold each lengthwise, right sides together. Stitch seam and turn and press. Snip neck strap (NS) in half and recombine it by means of a snap. Then turn in seam allowance on the ends of the two straps and top stitch.
12. The shorter strap (TS) is run through the four upper loops of the helmet and tied in a bow. The chin strap (NS) is run through the loops at the neck and chin and tied under the chin.



13. A football chin guard can be attached using hammer-on snaps to adapt.

A variety of high quality, commercially-made helmets can be purchased through Danmar.



**Cautions:** The snap opening at the center back of the chin strap is essential. An adult can unsnap this easily if the child ever gets caught or if his position makes the bow at the throat too tight.

**Maintenance:** Keep clean.

**Reference:** Robinault, 1973; Danmar.



### Crawling Shoe -Toe Protector

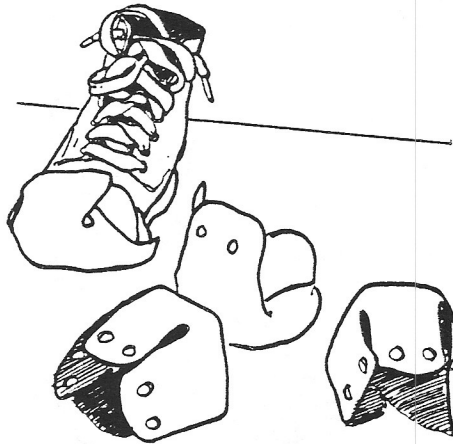
**Purpose:** To protect toe of shoe.

**Suggested Uses:** Place on shoes when child is up and crawling around.

**Materials:** Plastic bottle with oval or rectangular shaped base, rubber (strip from inner tube).

#### **Construction/Design:**

1. Select bottle with oval or rectangular shaped base.
2. Cut to size of child's shoe.
3. Pierce holes.
4. Fold center over sides, matching holes.
5. Thread rubber (inner tube strip) through holes and knot around heel of shoe.



**Cautions:** Be certain laces are tied and there are no sharp, broken, or jagged edges.

**Maintenance:** Replace as necessary.

**Reference:** Nathan, 1970.

## Elbow Restraint

**Purpose:** Keep arm straight.

**Suggested Uses:** Helpful for preventing face picking, eye poking, etc.

**Materials:** Cylinder plastic bottle (long enough for elbow flexion - 8" length is sufficient for adult), sweatshirt sleeve.

### **Construction/Design:**

1. Select cylinder plastic bottle to fit circumference of child's arm.
2. Pierce holes around top and bottom, sew to sweatshirt sleeve.
3. Sweatshirt sleeve may be stitched daily at neck, pinned, or snapped in place, depending on individual's need or destruction ability of child.
4. Plastic sleeve may be split and laced together, if necessary.



**Cautions:** Should not be left on too long or when child is standing and mobile  
- makes it difficult for child to catch himself if he falls.

**Maintenance:** Check for sharp, broken, or jagged edges. Recut or replace as necessary. Clean often.

**Reference:** Nathan, 1970.

### Knee Pads for Crawling

**Purpose:** For tender knees and to get traction.

**Suggested Uses:** Any time child is on knees. May also be used for bed patient's elbow and heels to prevent sheet burns. Fit elastic to limb circumference.

**Materials:** 1/2" thick scrap urethane sponge, bias tape or material, 3/4" wide elastic bands, hooks or Velcro.

**Construction/Design:**

1. Use 1/2" thick scrap urethane sponge from car or furniture repair shop. Cut 4-1/2" x 8".
2. Bind with bias tape or material, 1/2" overall.
3. Add 3/4" wide elastic bands (2) by one-half circumference of child's knee. Stitch one side to pad; add hooks or Velcro to opposite side (for easy application and removal over knees).
4. Sponge must be uncovered for traction on floor.
5. Urethane sponge can be washed and squeeze towel dried.

**Cautions:** Make sure elastic bands are not too tight around child's knee.

**Maintenance:** Keep clean and repair or replace as necessary.

**Reference:** Nathan, 1970.

## Thigh and Wrist Cuff

**Purpose:** Stabilizes extremities.

**Suggested Uses:** Can be used for thigh abduction or to stabilize wrist of one hand while child is using the other hand to engage in an activity.

**Materials:** Plastic bottle, denim for cover casing.

### **Construction/Design:**

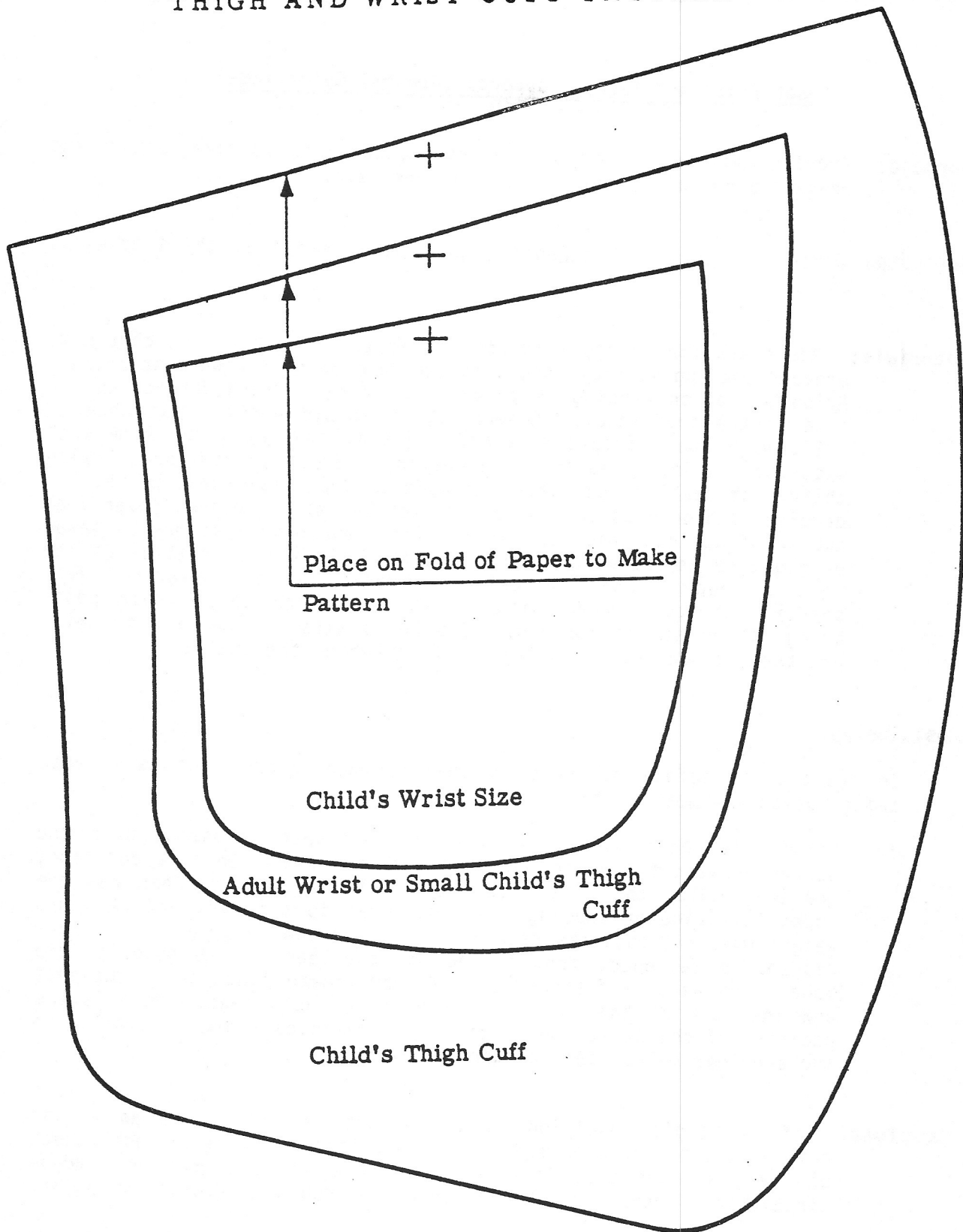
1. Cut pattern (see next page) on fold; place opened pattern with fold opposite handle on plastic bottle. Trace around pattern; submerge bottle in hot water. Cut with ordinary scissors (plastic bottle handle saved for utensil holder).
2. Add 5/8" to opened pattern for cloth cover. For cover casing use denim or Indian head material.
3. Prepare tying straps - double material and stitch all sides to prevent raveling. Sew straps with double seams at X on the outside material before sewing casing together. Child's wrist strap should be 1" x 12" long when finished. Child's thigh strap finished is 1" x 18" long.
4. Wrap cuff around limb, tie slip knot, then tie strap to lapboard, wheelchair, etc., for stabilization of extremity.

**Cautions:** Be certain that there are no sharp or jagged edges that might injure child.

**Maintenance:** Clean often, repair or replace as needed.

**Reference:** Nathan, 1970.

# THIGH AND WRIST CUFF PATTERN



ACTUAL SIZE

## Seat Belts and Safety Supports (General Guidelines)

**Purpose:** Provides minimal amount of support necessary to improve posture and prevent a child from falling out of his seat.

**Suggested Uses:** The postural support should be lessened as child develops control.

**Materials:** Materials for safety supports and seat belts should be chosen to prevent chafing so they should not wrinkle or narrow when stretched. Nylon or cotton webbing is porous, yet firm. Width depends on the size of the individual. Generally, it should not be less than 1-1/2", with the possible exception of tiny children, for whom a 1" width may be indicated to avoid chafing. Scout or army belts, with their flat buckles, can often be used as improvised seat belts. If padding is needed to prevent or correct any mild chafing, cover foam rubber of desired thickness with plastic sheeting that may be sewed or glued to underside of pressure area. Shift the position of the belt or buckle when indicated. A belt can be improvised from sheeting strips. Start with a loop around the back chair post, bringing the strips forward. The child sits on the strips, which are then looped over each leg and tied behind the chair.

### **Positioning:**

In positioning safety supports in chairs, wheelchairs, and cars, auto safety belts are most useful:

1. Firmly fastened under the back edge of seat, crossing over the wearer between the upper thigh and pelvic area. In this position, the belt holds the hips back and firmly in place. This has the added advantage of causing the individual to sit back and rest his weight over his buttocks rather than on the lower spine.
2. Diagonally fastened, from behind one shoulder to the opposite hip bone. The belt is fastened at the approximate junction of the seat and the back of the chair, wheelchair, or auto seat. This is the position of the safety belts of many foreign cars and is similar to the shoulder belts used in American cars.

**Cautions:** If a child's condition is so serious as to require an actual restraint, it should be medically prescribed. Make a periodic check of every support that is used to be sure that it does not impede circulation, interfere with breathing, or rub the skin at any point.

**Reference:** Robinault, 1973.

## Vest for Trunk Support

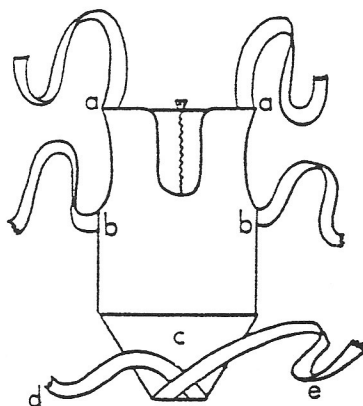
**Purpose:** Provides trunk support with ties to chair or wheelchair.

**Suggested Uses:** Any time you want to free child's hands so that he can participate in various activities.

**Materials:** 1-1/4 yards of denim, thread, 7"-9" front opening, non-separating zipper.

### **Construction/Design:**

1. Ties sewn into shoulder seam at (a).
2. Ties sewn into side seam at underarm (b).
3. The back is elongated so child sits on (c) and ties (d) and (e) come up between the thighs, with (d) crossing over right groin and (e) crossing over left groin to be tied at lower back of chair where seat of chair meets the back. Tie (d) and (e) loose enough to allow some free play of legs.



**Cautions:** Only to be worn over clothing. Cord should never be used for ties; tie should not be narrower than 1" webbing. Article should not be used for anyone whose breathing pattern may be restricted by it or whose motions cause any of the ties to leave the slightest mark on the skin of the wearer. Inspect frequently.

**Maintenance:** Keep clean and check periodically for weaknesses in construction. Repair or replace as necessary.

**Reference:** Robinault, 1973.





SECTION III

Switches



## SWITCHES

The use of switches to independently operate battery-operated devices makes available new activities, challenges, and opportunities for moderately and severely handicapped individuals. Through the modification of tasks that the individual may have been dependent upon others to do for them, a new independence may be created for the handicapped individual. The primary objectives for using adaptive switches to operate various pieces of equipment range from basic reinforcement to total independent control of the individual's environment. The switch type is dependent upon the intended user's skill level and disability, the device to be used, the activity to be taught, and the environment in which it will most frequently be used.

Many persons working with individuals with handicaps are often fearful of working with electrical devices, switches, and wiring and usually have had little experience or exposure to this type of activity. In reality, an understanding of basic electric circuits, being able to decipher simple schematics for assembly, and being able to connect wires, solder, and drill assembly parts will allow even the naive trainer to produce effective switches for users. One other aspect of using switches is being able to effectively evaluate when their use directly benefits the individual.

### DECIDING WHEN TO USE A SWITCH

York, Nietupski, and Hamre-Nietupski (1985) present guidelines for trainers making decisions about the use of switches in the Journal of the Association for the Severely Handicapped (JASH). The process they outlined for deciding whether to use a switch is presented in a figure from that article:

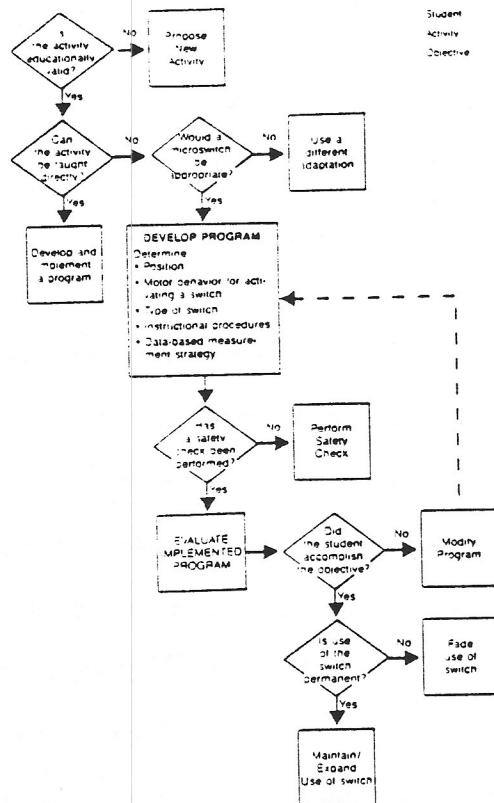


Figure 1. A decision-making process for use of microswitches.

In addition, York, Nietupski, and Hamre-Nietupski (1985) present some excellent safety considerations for trainers utilizing switches with individuals who have handicaps:

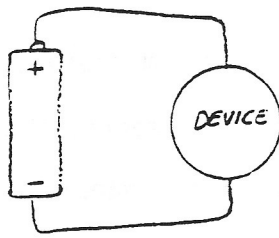
1. Always seek expert advice from an electrician, an electrical engineer, or a qualified radio/electronic technician when questions arise or when equipment is malfunctioning.
2. When using microswitches to activate plug-in devices, either use an optical isolator or a power relay (also called a voltage regulator) in your circuit to decrease the 110 V from your household electrical outlet to a safe level for the microswitch. The amount of voltage

which typically goes to the microswitch is 6 V. **Caution:** When using devices with heating elements, such as a hair dryer or popcorn popper, a power relay that can handle a higher number of watts must be used.

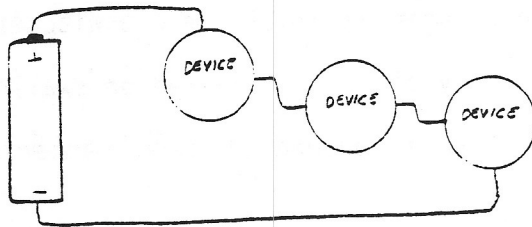
3. Always check for frayed and exposed wires and replace/repair as necessary.
4. Be careful that wires and cords are positioned such that students cannot become tangled in them.
5. Use tin solder, not lead solder, when assembling microswitches.
6. Secure small microswitches so they cannot be inhaled or swallowed.
7. Batteries contain acid, so be sure damaged or used batteries are disposed of properly.
8. Mercury is a poison, thus encase mercury microswitches in plastic tubing or glue. Use caution when handling mercury switches and keep them safely stored when not in use.
9. Check to be sure that microswitches and other equipment are free of rough and sharp edges to avoid abrasions and puncture wounds.
10. Check with a physician prior to using any electrical devices with students who have heart problems or use electrical medical equipment.

### UNDERSTANDING CIRCUITS

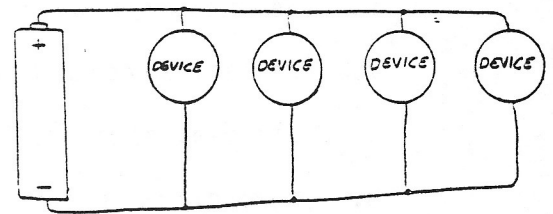
An electrical circuit is any arrangement that permits an electrical current to flow. A circuit can be simple or quite complicated. A basic circuit consists of a source of electrical current (a battery), a device, and two connection wires.



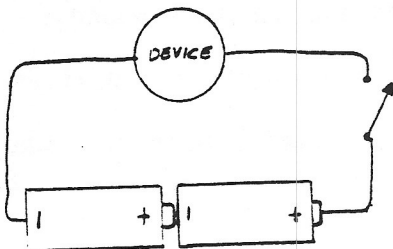
A circuit may include more than one component (switch, lamp, motor, etc.). A series circuit is formed when current flowing through one component first flows through another.



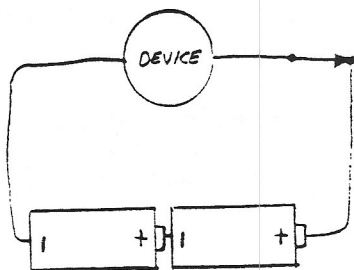
A parallel circuit looks like this:



When a switch is placed into a circuit, it interrupts the flow of electricity and the circuit looks like this:



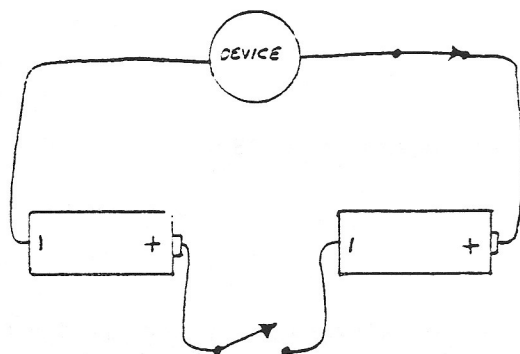
When the switch is open, the electricity cannot flow and the device is off.



When the switch is closed, the circuit is complete and the electricity flows and the device operates.

There are basically two kinds of switches: normally open and normally closed. A normally open switch requires that the switch close the circuit to operate the device. With a normally closed switch, the device operates when the switch is inverted and interrupts the circuit.

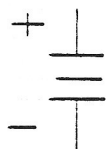
A battery interrupter or external device switch works by breaking the circuit and allowing you to control the device through the use of the second switch in the circuit.



Both the switch on the device and the external user's switch must be closed to operate the device.

### READING SCHEMATICS

Most simple electrical schematics use the following symbols:



Battery



Lamp



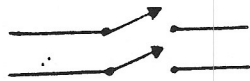
Switch open (single throw)



Switch closed (single throw)



Single pole double throw switch



Double pole single throw



Pushbutton normally open



Pushbutton normally closed



Fixed resistor (Resistors are used to limit electrical current flow)



Wire (usually will specify gauge and conductor number)



Device

## HOW TO SOLDER

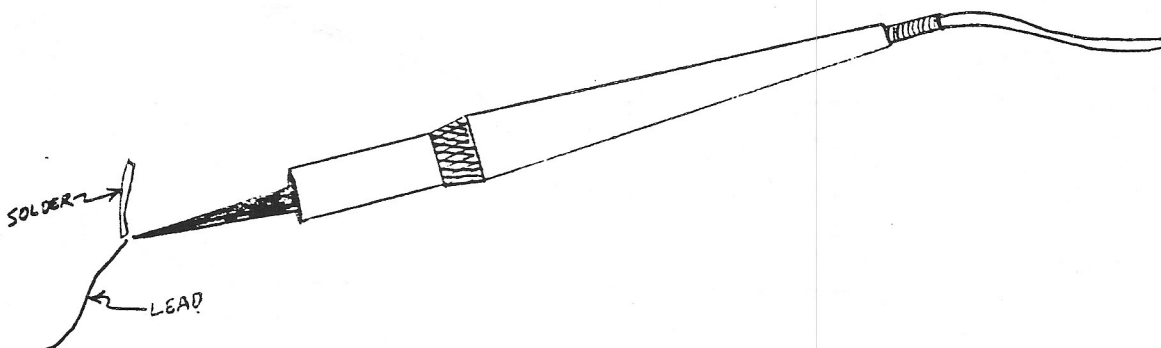
Careful soldering is essential in creating a functional circuit. A hot soldering iron can cause injury or damage. Unplug the iron when it is not in



use and be sure the cord is not in the way so that you trip over it or hit it against your body or clothing. A stand (holder) for the iron is your best insurance against damage or injury from a hot iron.

Steps to successful soldering:

1. Use a low wattage soldering iron (25-40 W). Be sure to tin the tip according to the manufacturer's directions.
2. Always use rosin core solder when soldering electronic components. Acid core solder will corrode the leads.
3. Solder does not adhere to paint, grease, oil, wax, or melted insulation. It is important to be certain that the area to be soldered is free of all such foreign matter by using a solvent, steel wool, or fine sandpaper to clean it off.
4. To solder, heat the connection, not the solder, for a few seconds with the hot tip of the iron. Leave the iron in place and apply the solder.
5. Allow the solder to flow through and about the connection before taking the iron away. Don't apply too much or move the connecting piece before the solder cools.
6. Keep the tip of the iron clean and shiny. Wipe off debris with a damp sponge.

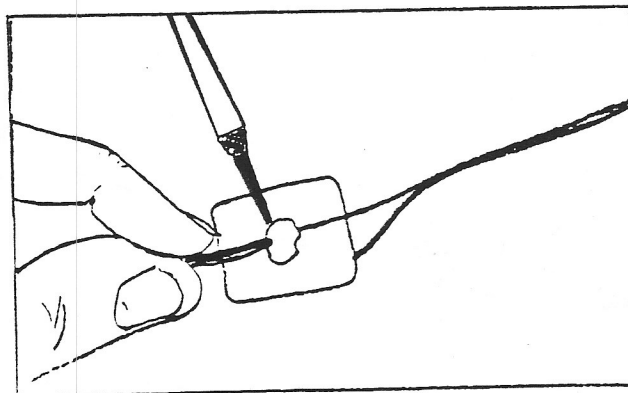


Note: Wires can also be connected by using plastic connectors. Often the smaller gauge of wire used with switches and battery-operated devices are more successfully built and repaired by soldering the connections.

### MODIFYING THE DEVICE

In order to modify a switch used to operate a battery-powered device, the circuit must be interrupted so that an alternate form of switching may take place. Many battery-powered toys and devices are complicated and are wired on circuit boards with transistors and tiny pieces of wire that are in hard to reach places. The battery compartment in the device itself is often the easiest spot to reach and utilize when you attempt to modify the device.

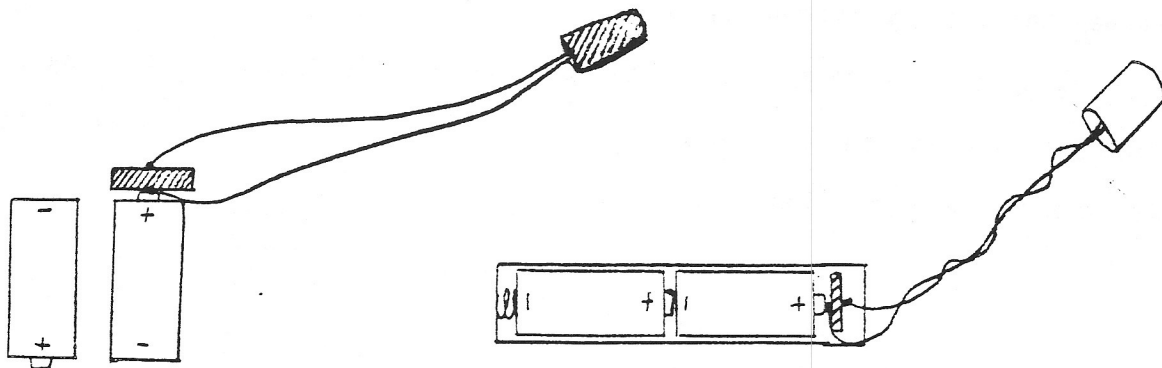
Several in-line procedures may be used. One in-line procedure described by Higgins (1982) utilizes a piece of copper clad circuit board cut to the approximate diameter of the battery used in the device. A 12" long piece of 22 gauge silver/copper speaker wire is then split 1" on the end and separated and then each piece of wire is soldered to each side of the copper clad board. Note: Stripped wires should not make contact.



The other end of the wire is then attached to a mini phone jack. Don't forget to place the cap on the wire before you solder the wires in place and twist the wire several times to tighten the strands. This simplifies threading the wire through the holes in the jack. Thread either wire through the shortest part of the jack and solder. Use a small amount of solder to adhere to wire. Snip off any excess wire. Then thread the remaining wire through the longest part of the jack and solder. Use a small amount of solder and clip the excess wire.

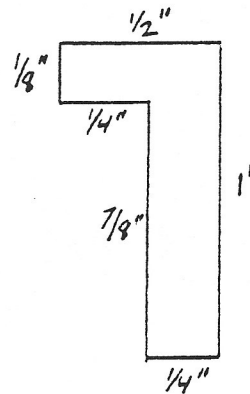


Screw the plastic cap to the jack. If it does not fit, you may have used too much solder. Touch heated soldering iron gently to soldered connection to remove excess. Then place the copper square on either end of battery or between the battery and the metal contact.

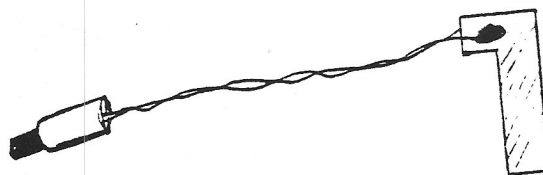


If the battery-powered device has an on-off switch, be sure to leave it in the "on" position.

Vanderheiden (1980) describes three types of battery interrupters that are used the same way the in-line jack is used. The type 1 interrupter described by Vanderheiden uses speaker wire, a plug, and a piece of double-sided, printed circuit board cut to the dimension described and coated (both sides) with solder by heating the sides and rubbing them with the soldering iron tip while applying solder sparingly.

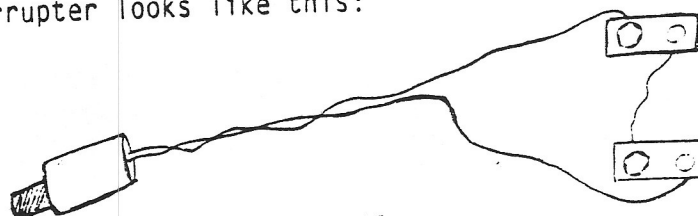


The type 1 interrupter is for use with regular AA, C, or D batteries. The fully assembled interrupter looks like this:



The soldered circuit board is then placed between the batteries or between the battery and the metal contact.

The type 2 interrupter described by Vanderheiden (1980) is for use with transistor radios and other devices which use a 9-volt battery with snaps. The type 2 interrupter looks like this:



To use the type 2 interrupter, the battery is removed from the battery case and one set of snaps on the interrupter is attached to the battery snaps. The other snaps on the interrupter are attached to the snaps inside the battery compartment on the device.

The type 3 interrupter described by Vanderheiden (1980) is for devices that have a remote jack on their side. The type 3 interrupter is made by attaching 1/8" miniature plugs on each end of a piece of audio cable:



The interrupter is used by simply plugging the plug into the remote jack and then plugging the other end into the adaptive switching device.

### SWITCHES

There are many types of switches that can be made or used. The basic switches that are typically utilized for adaptive switch devices are: lever, contact, 2-part contact, pushbutton, and mercury switches. The switches, descriptors and references on how to construct them, and suggested uses for the switches are provided in this section.

## Contact

**Purpose:** To activate a battery-powered device by completing a circuit through the contact of two metal objects or pieces. This type of switch has the greatest number of applications.

**Suggested Uses:** Can be used for pressure response when two pieces are pushed together or for pulling response when the pulling action bring the two metal contact points together, or even for dropping or placing objects onto or into something else, making contact. One suggested use requires a pincer grasp response.

**Materials:** Metal contact objects, i.e., washers, cookie sheets, metal spoons, funnels, copper circuit board pieces.

### **Construction/Design:**

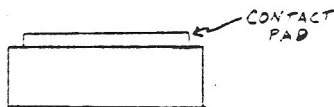
Pull switch - Burkhardt, 1980  
Puzzle switch - Burkhardt, 1980  
Canning lid with light -  
Burkhardt, 1980  
Cookie sheet switch - Burkhardt,  
1982  
Plastic notebook switch -  
Burkhardt, 1982  
Double weight bearing switch -  
Burkhardt, 1982  
Trapeze pull switch - Burkhardt,  
1982  
Film can pull switch - Burkhardt,  
1982  
Grasp switch - Burkhardt, 1982

Penny pincher - Burkhardt, 1982  
Wet pants signaler - Burkhardt,  
1982  
Potty training switch (uses  
alarm system with modifica-  
tion) - Burkhardt, 1982  
Kitchen switch - Burkhardt, 1982  
Blow switch - Burkhardt, 1982  
Objects in container switch -  
Burkhardt, 1982  
Pre-writing switch - Burkhardt,  
1982  
Two-directional rocking switch  
- Burkhardt, 1982  
Pillow switch - Higgins, 1982

See directions for wiring 1 type 2-point contact switch.

**Cautions:** Put cover over metal parts that touch child's hands or body, but be careful that the cover does not prevent direct contact.

**Maintenance:** Keep contact points clean. All solder points and connections are secure.



### Wiring Contact 2-Point Switches

2 pieces metal, e.g., copper pennies  
5' 2 conductor 22 gauge stranded wire  
1 subminiature or miniature plug  
1/4" thick piece of foam, spring, or other flexible material

1. Split and strip both ends of wire - all four pieces.
2. Solder the plug to one end using both pieces. (See attachment of plug directions under modifying the device directions, this section.)
3. Solder the other ends of the wire to each metal contact point. The coating on the wire should go right up to the edge of the metal contact. The foam or some other flexible material, much smaller in diameter than the metal contact points, or a spring may keep the metal contact points separated until the contact points are pushed, pulled, or somehow brought together.

## Lever Switch

**Purpose:** Switch to use in any modification where a downward pressure will act as the controlling force in the opening or closing of the switch itself.

**Suggested Uses:** May be used when large (touch panel) or foot/hand treadle type switch or hand squeeze (pressure switch) is required for user.

**Materials:** Radio Shack #257-017 lever switch - sub-mini roller lever, 22 gauge 2 conductor wire.

### **Construction/Design:**

Touch panel switch - Higgins, 1982  
Flipper switch - Burkhart, 1980  
Cheek switch - Burkhart, 1980  
Transistor radio cheek switch - Burkhart, 1980 (modified)  
Electronic busy box (uses 3 lever switches) - Burkhart, 1980  
Two-choice communication board (uses 2 cheek [lever] switches) -  
Burkhart, 1980  
Pressure switch - Burkhart, 1982  
Double cheek switch - Burkhart, 1982  
Dowel rod squeeze switch - See drawing on next page

See directions on next page for wiring lever switch.

Note: More than one lever switch can be wired between pressure panels if the area is rather large then wired together. Pressure on either switch will activate the device.

**Cautions:** Be certain individual stripped wires are not touching each other. If solder point may touch child's mouth, use tin solder (sometimes sold as aluminum solder) because it does not contain lead.

**Maintenance:** Be certain contacts are solid and a complete circuit between switch and in the device is maintained. Keep switch clean.

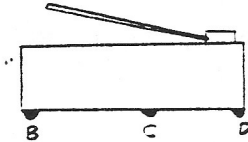
Note: A contact pad microswitch may be a preferable alternative in designs using the lever type switch.



### Directions for Wiring Lever Switch

1. Take speaker wire and separate 1" on each end. Strip the covering off all four end pieces using a scissor or wire stripper.

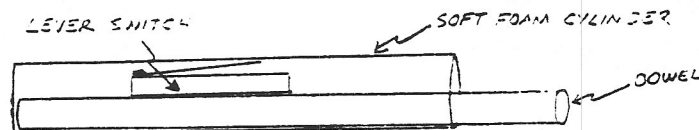
2.



Place wire 1 through attachment contact C and wire 2 through contact D. Twist to secure. Do not let wires touch.

3. Place switch on a flat surface. Place copper board piece between wires 3 and 4. Solder a wire on each side. Solder the C and D contacts.
4. If making a panel switch or pedal type, remove the silver metal piece from the top of the lever switch by lifting it upright and sliding it off. The raised black piece is the actual switch.

### Dowel Squeeze Switch



## Mercury Switch

**Purpose:** Switch to use in any modification where random movement or maintenance of a position will be used to maintain the completed circuit to activate the device.

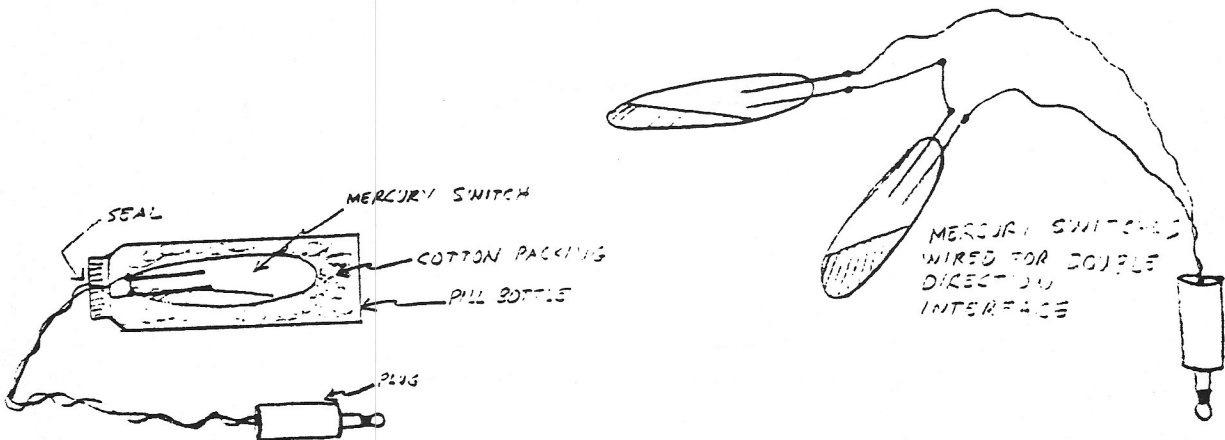
**Suggested Uses:** Useful for monitoring head control and encouraging stimulation of movement.

**Materials:** Mercury switch - preferably with plastic outer shell to prevent breakage. If you can only obtain glass, cover with glue or plastic pill bottle to prevent spillage of the mercury if broken.

### **Construction/Design:**

Nickie switch - Burkhart, 1980

Double directional head switch - Burkhart, 1982



**Cautions:** Be sure switch is unbreakable or is wrapped or encapsulated in something to prevent spillage of the mercury which is poisonous if swallowed.

**Maintenance:** Be sure switch is fully encapsulated and connections are tight and not wobbly.

## Pushbutton

**Purpose:** To use when modifying a battery-powered device and the student is able to push a button with either a thumb or single finger action or with some other action.

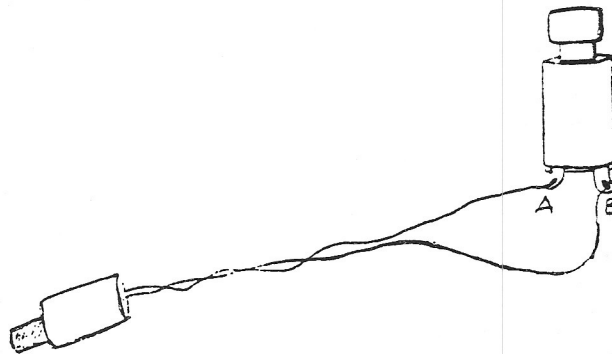
**Suggested Uses:** Use in place of a dial-rotary type or slide switch.

**Materials:** Push button switch, 22 gauge wire (stranded), miniature plug.

### **Construction/Design:**

Slide projector switch - Burkhart, 1982

1. Take speaker wire and separate 1" on each end. Strip the covering off all four end pieces using a scissor or wire stripper.
2. Place end 1 through A and end 2 through B. Secure wire by twisting around end of contact. Solder connection.
3. Attach plug (see page on plug directions under modifying the device directions in this section) and use with battery-powered device.



Pushbuttons come in both normally open and normally closed types.

**Cautions:** Be certain ends of wire do not touch each other.

**Maintenance:** Watch for frayed connection. Keep buttons clean and free of foreign matter.



SECTION IV  
Leisure and Exercise



## LEISURE, EXERCISE, MOBILITY

We all need to relax and play, and persons with handicaps are no exception. The handicapped person is often deprived of many opportunities to play and relax. Simple barriers that may cause major problems may overcome through adapting equipment to the individual and the activity. Through individual adaptation, impaired persons may enjoy many playtime and pleasurable activities with their nonhandicapped peers. Adaptive equipment allows the handicapped individual to be an active participant in his/her environment.

As his/her independence level increases, the individual can more actively interact with others. As this interaction ability increases, his/her social skills also may increase by virtue of increased exposure and practice. As he/she is in the regular environment, dealing with normal individuals, the handicapped individual develops an increased self-confidence level because he/she is able to demonstrate that they can handle most situations as they occur in the regular environment.

Most importantly, as the handicapped individual gains independence, he/she gives up his/her dependence on others to care for and entertain him/her. This outcome is cost effective as well as providing the least restrictive environment.

There are many items commercially available that are reasonable in cost and therefore do not need to be built. Wheelchairs, walkers, canes, crutches, along with hydraulic lifts, are available through suppliers such as Preston and Fred Sammons.

The purpose of this section is to provide recreational personnel with ideas and adaptations of physical education equipment that will assist in

allowing those with handicaps to participate in leisure and recreational activities. The use of this equipment should help facilitate increased motoric ability and spatial orientation. The equipment presented in this section was selected on the basis of availability of materials, ease of construction, and variety of possible uses. All of the equipment in this section has the potential of being dangerous. It should be used only under constant adult supervision.



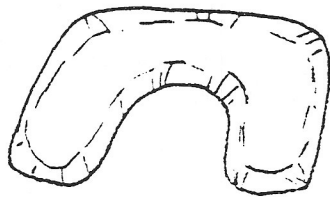
### Aquatic Head Support

**Purpose:** Provides persons with handicaps more freedom in an aquatic setting.

**Suggested Uses:** In a swimming pool or therapy pool.

**Materials:** Head piece only from a sectional life jacket.

**Design:**



**Cautions:** Supervision by competent personnel is essential while aquatic aids are in use and clients are near water or pool.

**Maintenance:** The section used should be free from tears or rips.

### Aquatic Stabilizer Bar

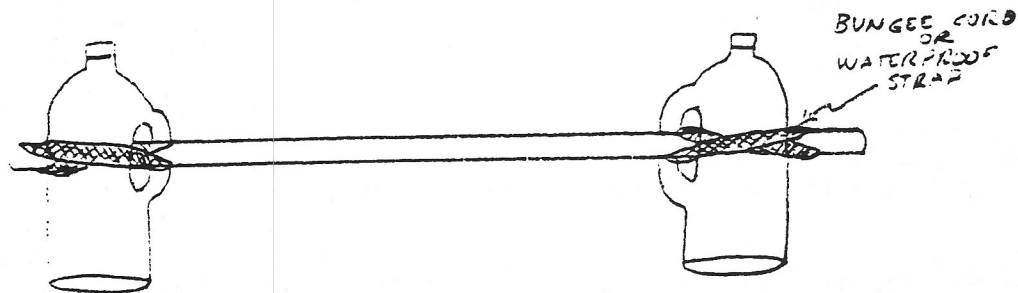
**Purpose:** Facilitates the use of an aquatic environment for pleasure or therapy.

**Suggested Uses:** P.E. time or therapy in a swimming pool.

**Materials:** 2 empty plastic gallon jugs with lids, 1 1" dowel or PVC plastic pipe 36" long, 2 12" straps.

#### **Construction/Design:**

Tie the capped empty jugs to the dowel with the straps, leaving enough room in the middle for the child's pectoral girdle.



**Cautions:** Supervision by competent personnel is essential while aquatic aids are in use.

**Maintenance:** Rinse off after use in the swimming pool.

**Reference:** Also available through DanMar Products.

## Balance Beam

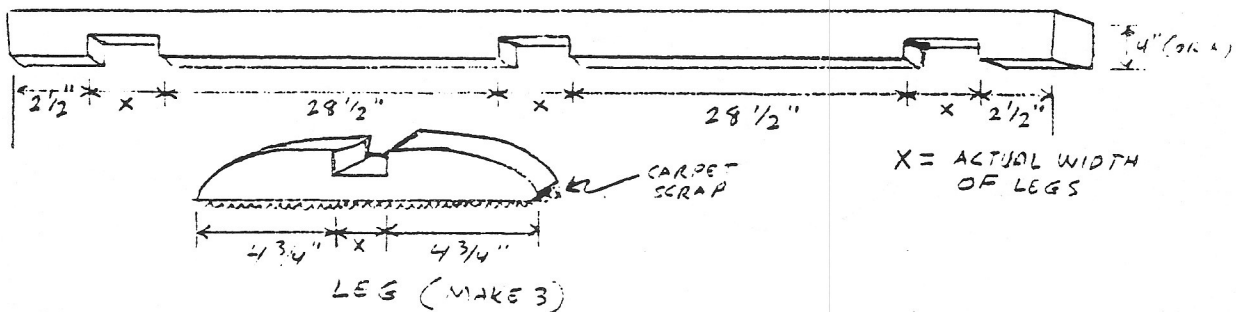
**Purpose:** Facilitates perceptual motor integration and balance.

**Suggested Uses:** Gross motor skill development, P.E. time.

**Materials:** 1" 4 x 4 board, 6 feet long; 3 pieces of 4 x 4, 12" long; glue; screws.

### **Construction/Design:**

1. Notch the beam.
2. Notch the legs.
3. Glue notched legs into notches in beam. Use screws to reinforce joints. Carpet bottom of legs to reduce noise and scratching.



**Cautions:** Close supervision is suggested.

**Maintenance:** Tighten base piece as it may work loose. Watch for wearing of carpet.

## Beeper Ball

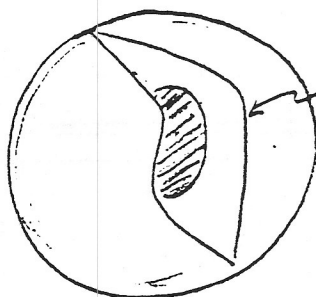
**Purpose:** To allow visually impaired individuals to participate in group activities.

**Suggested Uses:** Wiffleball, catch, target games.

**Materials:** Nerf ball 10" in diameter, a simple battery run beeper from electronic supply house.

### **Construction/Design:**

Cut the nerf ball half way or less. Put beeper inside and glue the ball closed. Feel the ball to find the on/off button on the beeper. Turn it on and play.



SLICE BALL  
APPROXIMATELY  
1/3 AND HOLLOW  
OUT FOR DEVICE.  
THEN, RE-GLUE

**Cautions:** With a battery enclosed, the ball has weight and a hard surface. It may cause injury if it hits someone.

**Maintenance:** Keep track of battery, open ball and replace as needed.

**Reference:** Bell Pioneer Telephone employee groups will also provide constructed beeper balls to groups working with the handicapped. Contact your local Pioneer employee group for information.

### Bowling Ramp

**Purpose:** Allows handicapped individuals to enjoy the same kinds of recreation as their nonhandicapped peers.

**Suggested Uses:** At a bowling alley or in a simulated situation in a gym at a school or center.

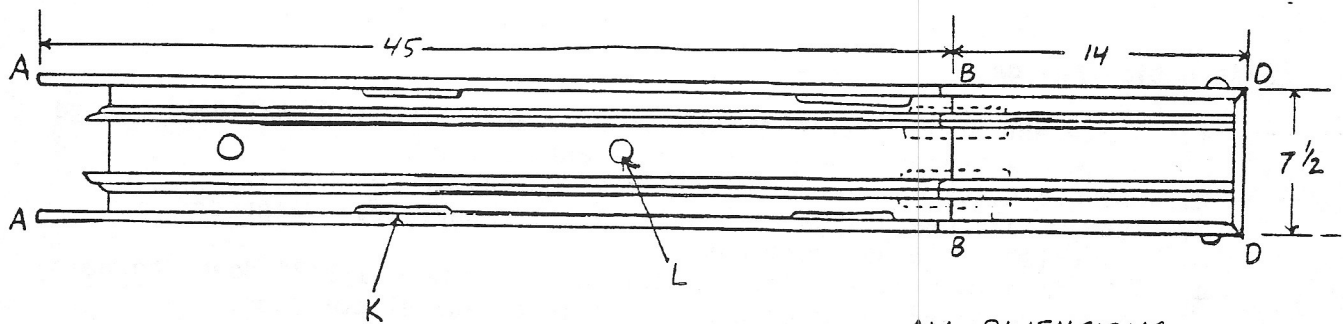
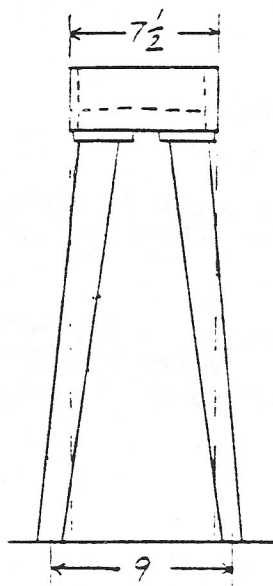
#### **Materials and Construction/Design:**

1. Legs can be made of wood or metal.
2. Chute bottom is made of hardwood braced at top by hardwood blocks (H) and has cutouts (K) for attachment of sides, and holes (L) 1/2 inch in diameter.
3. Chute sides (S) may be made of 1/8 inch chipboard or 1/2 inch plywood.
4. Chute rails (J) are of Bakelite or hardwood, with a notch (G) for ball stop.
5. Rubber (A-E) is applied at the base of the chute. Section C-C can also be purchased commercially.

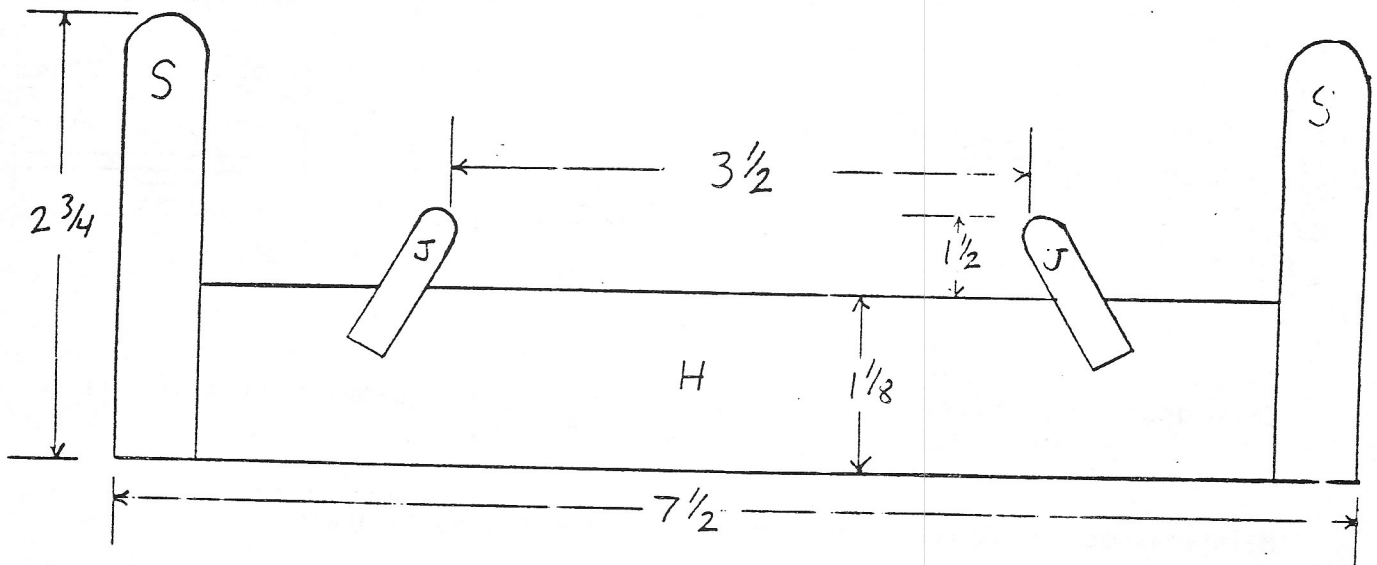
For diagram for construction of bowling chute, see following pages. (A) Side view showing dimensions: alley floor; bend in chute (B); chute (C-C); back edge where player stands (D); rubber mat on floor at bottom of chute. (B) Side view. (C) Rear view, showing dimensions. (D) Section C-C, showing supporting block, H; sides S; (E) Top view of full length of chute, showing end resting on floor, A; rails, J; notches, K; bend in chute, B; and rear edge, D. (Courtesy of United Cerebral Palsy of North West Pennsylvania, Erie, PA.)

**Reference:** J. A. Preston Company.





ALL DIMENSIONS  
IN INCHES

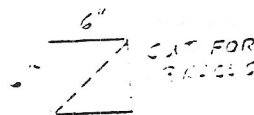


## Large Equilibrium Board

**Purpose:** Facilitates and promotes development of balance.

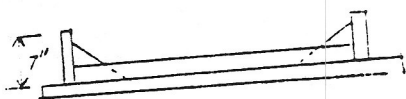
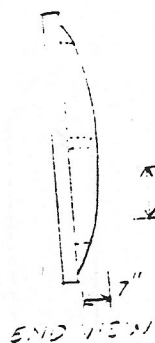
**Suggested Uses:** During P.E. or free-play time, this piece of equipment is large enough for 2 children to stand on or one child on "all fours."

**Materials:** 1 piece  $\frac{3}{4}$ " plywood, 48" x 35"; 2 boards 1" x 3", 44" long; 2 boards 1" x 7", 35" long cut in a crescent; 1 board 1" x 6" x 6" cut diagonally; 16 screws  $1\frac{1}{2}$ " long,  $\frac{1}{2}$ " dowel 8-12" long cut into 4 pieces; glue.

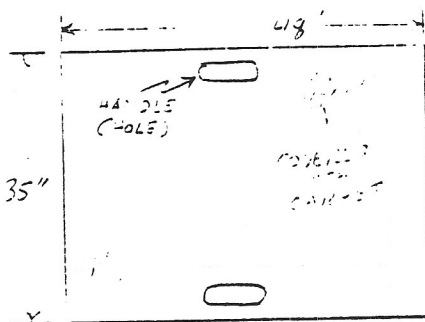


### **Construction/Design:**

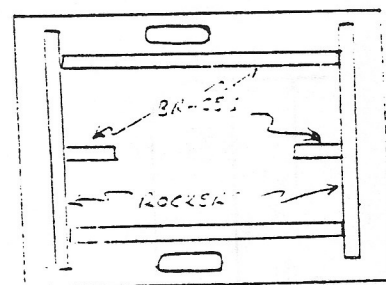
1. Glue and screw braces on bottom of board. The diagonal brackets go near the center of the crescent shaped pieces.
2. Handle holes in the main board make it easier to handle.
3. Cover main board with carpet for a nicer surface. Paint or varnish all other surfaces.
4. 6" from each side of the center bottom insert a  $\frac{1}{2}$ " dowel to help keep the board balanced when it is in a neutral position.



SIDE VIEW



TOP VIEW



BOTTOM VIEW

**Cautions:** Supervision is suggested with this equipment as there is a potential for loss of balance and falling.

**Maintenance:** Check for loose connections; replace worn carpet.



### Small Equilibrium Board

**Purpose:** Facilitates and encourages the development of balance.

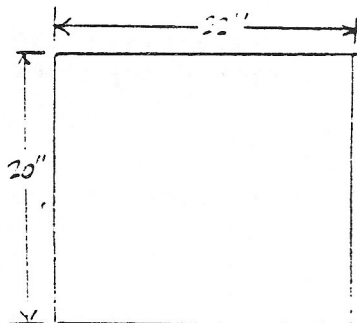
**Suggested Uses:** During P.E. or other gross motor development sessions.

**Materials:** 1 piece 5/8" plywood, 22" x 20"; 2 pieces 5/8" plywood, 19" x 3-1/2" cut in a crescent shape; 2 squares of 5/8" plywood 2-1/2" x 2-1/2" cut diagonally; 8 screws; glue.

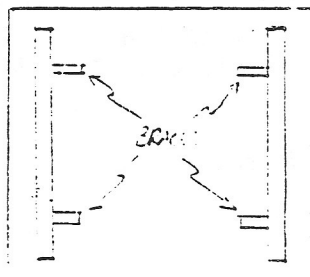


#### **Construction/Design:**

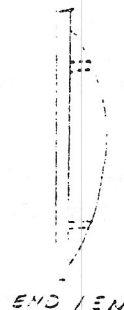
1. Glue and screw all seams.
2. Paint or varnish wood.



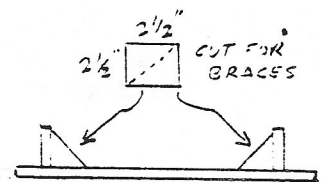
TOP VIEW



BOTTOM VIEW



END VIEW



SIDE VIEW

**Cautions:** A child could lose his balance and fall; supervision is suggested.

**Maintenance:** Check for loose joints, replace worn carpet.

## Floor Hockey Sticks

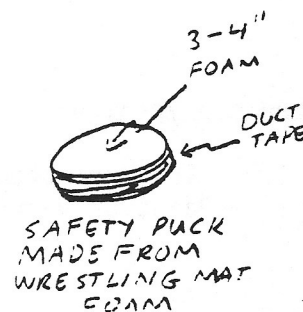
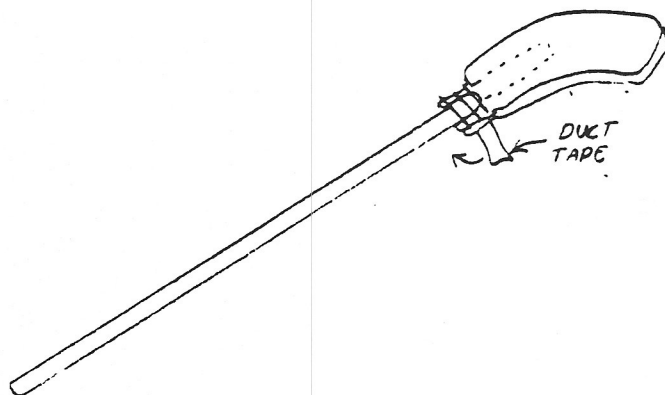
**Purpose:** Participation in a team game using a fairly large group of students.

**Suggested Uses:** During P.E. time or other "activities" time.

**Materials:** 1" wooden dowel 36" to 48" long per stick, wrestling mat foam 4" x 10" x 12" per stick, duct tape, glue.

### **Construction/Design:**

From the foam, cut a club-shape: Cut a hole in the top 2"-4" deep and the same diameter as the dowel. Glue the dowel into the hole; wrap the neck of the club with duct tape to help secure it.



The dowels can be painted two different colors to differentiate the teams. Modifications can be made to the strike area or face of the stick to make it larger and easier to hit objects with.

**Cautions:** The hockey stick is foam and fairly soft, but it still has the potential to be harmful.

**Maintenance:** Keep the hockey sticks in a garbage can for easy access and storage.

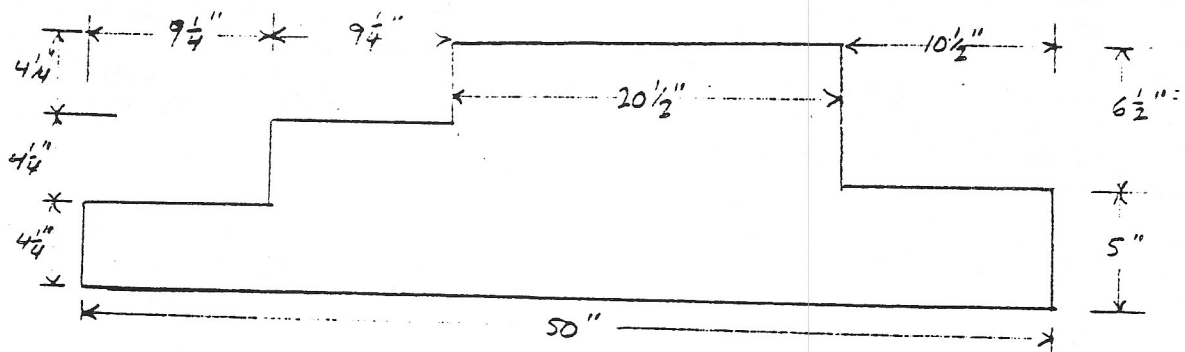
**Reference:** Also available through Gopher Athletics.

## Graduated Stairs with Handrails

**Purpose:** Facilitates gross motor movement and mobility in a safe and controlled environment.

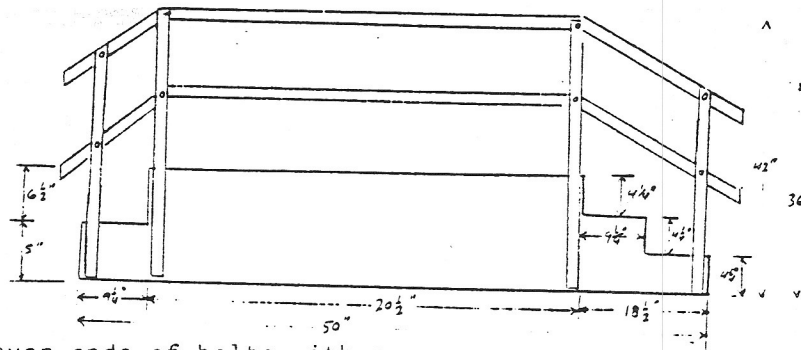
**Suggested Uses:** P.E. time, physical therapy, gross motor training.

**Materials:** From 3/4" plywood cut 2 pieces 11" x 50": cut in stairs; stair surfaces: three 2 x 12's, 30" long; "tall stair" side-vertical pieces: two 2 x 6's, 30" long; "short stair" side-vertical pieces: three 2 x 4's, 30" long; top platform surface: 3/4" plywood 30" x 24", 40 bolts and 40 acorn caps.



### **Construction/Design:**

Between two side pieces, glue and nail vertical pieces then stair surfaces (horizontal pieces), putting on top platform last. Before assembling horizontal pieces, cover with rigid vinyl to create a slip-proof surface. Handrails: Place vertical pieces at edges of stairs as shown, both at top and bottom through plywood. Add top handrail, mitering the seams to fit. Double bolt the handrails to the posts. Add lower handrails, 11" down from top rail. Miter seams and bolt in place.



**Cautions:** Cover ends of bolts with acorn caps.

**Maintenance:** Varnish or paint all wood surfaces.

### Exercise Staircase Corner Style

**Purpose:** Facilitates gross motor movement and mobility in a safe and controlled environment.

**Suggested Uses:** P.E. time, physical therapy, gross motor movement training.

**Commercial Reference:**

This staircase can be easily changed from a straight to a corner style.

Deluxe Convertible Exercise Staircase--Here's an exercise staircase to fit into any departmental configuration. Just reposition a few nuts and bolts--in a matter of minutes--to change from a straight to a corner type staircase. Staircase is designed in two sections, with 30 in. wide steps and 30 in. square platform. Four 6 in. (15 cm) steps on one side, six 4 in. (10 cm) steps on the other side. Beautifully finished with two sets of handrails at heights of 15 in. (38 cm) and 32 in. (81 cm) to accommodate both children and adults.

Available through MIDLAND.

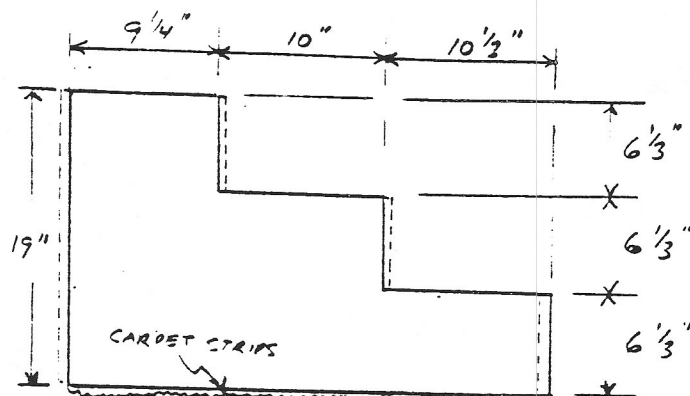
### Three Even Stairs

**Purpose:** Increase independence and balance through implementation of stair climbing practice.

**Suggested Uses:** Gross motor skill development, P.E. time.

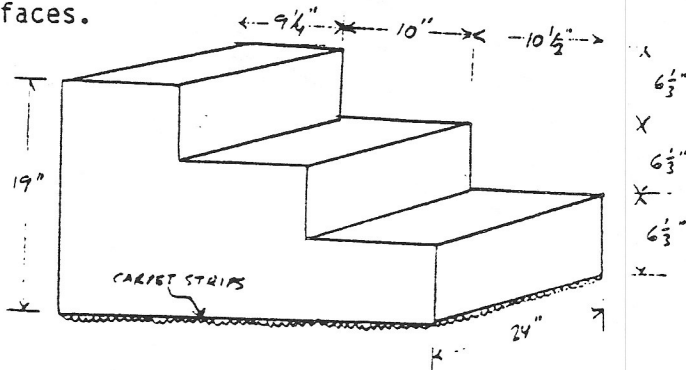
**Materials:** From 3/4" plywood:

- 3 pieces 10" x 24" (step surfaces)
- 3 pieces 6 1/4" x 24" (vertical surfaces)
- 2 pieces 22 1/2" x 4" (braces in back)
- 2 pieces dimensions of diagram
- small nails
- glue



#### **Construction/Design:**

Use notched pieces as sides; nail "step" pieces and vertical pieces in place. Put braces on each end of the 19" side. Nail and glue all seams. Paint or varnish finished stairs. Glue narrow strips of carpet on the bottom surfaces.



**Cautions:** Watch for loose parts. Use nonskid surface material on stairs and watch for wear. Replace as necessary.

**Maintenance:** Two of these units pushed together make a nice stair unit.

## Ladder

**Purpose:** Facilitates balance in upright position and develops alternating gait pattern.

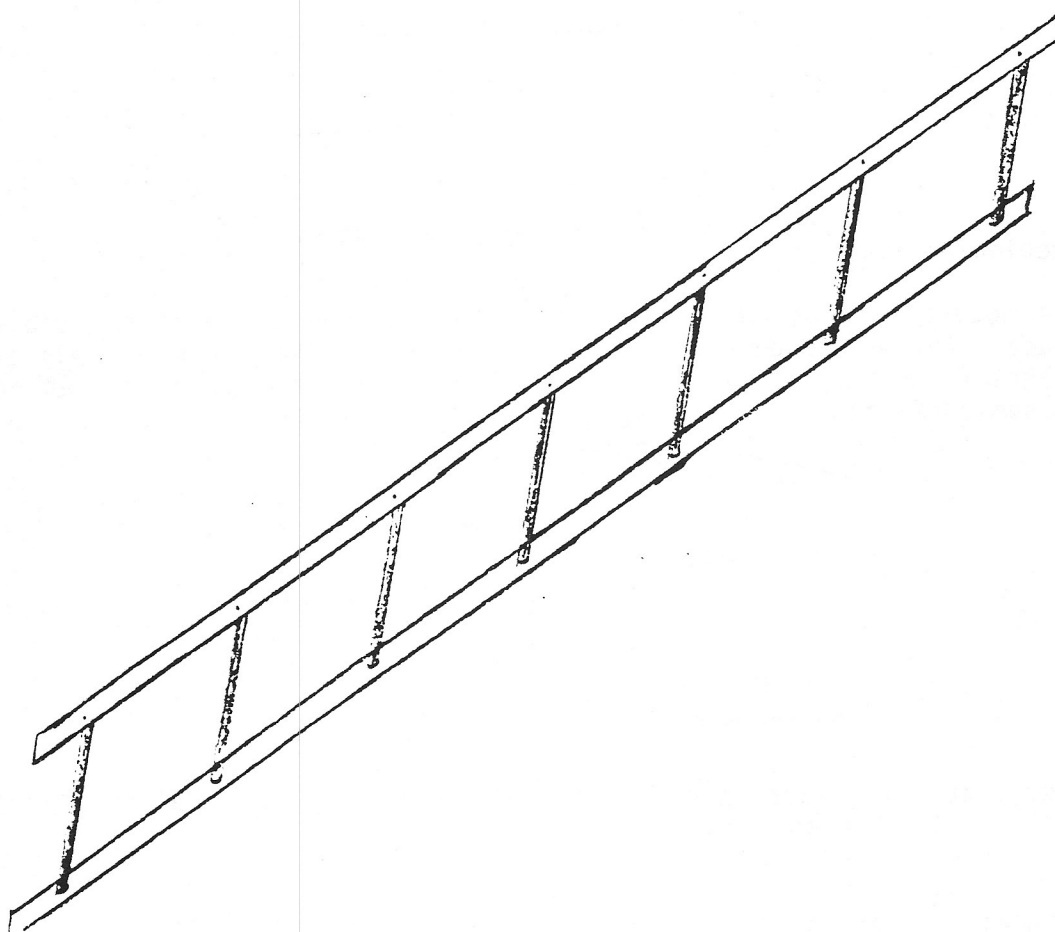
**Suggested Uses:** Place ladder on floor and have child walk between the rungs.

**Materials:** A flat ladder, preferably wooden, 12 to 24 feet long.

**Commercial Reference:** Local hardware store.

**Cautions:** Sometimes children trip and fall when walking through the rungs. Supervision is suggested.

**Maintenance:** Check surfaces for splinters and rough edges.

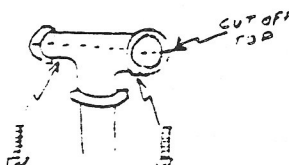


## Parallel Bars

**Purpose:** Facilitates muscle control, balance, and mobility by providing an apparatus for directional stability control.

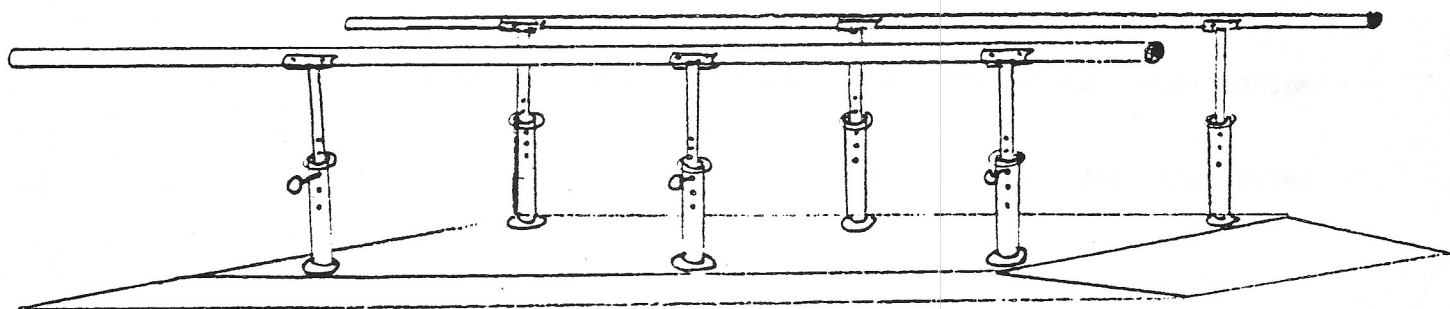
**Suggested Uses:** P.E. time, physical therapy sessions.

**Materials:** Available from lumber supply: 1 wooden platform, 26" x 8', tapered to floor level on both ends. Available from plumbing supply: 6 2-1/2" pipes, 16" long (with one 1/2" hole 2" from end) with threaded ends; 6 1-3/4" pipes, 16" long (with 9 1/2" holes 1" apart) - these fit inside the other pipes; 6 bolts, 1/2" x 3" (to hold height adjustment); 6 bases for pipes, bolted to the platform; 2 aluminum tubes, 1" x 8'; 6 T-pieces welded to pipes and bolted to aluminum tubes; 6 collars to the 2-1/2" pipe and allow the 1-3/4" pipes to move up and down.



### **Construction/Design:**

Secure pipe bases to platform. Screw larger pipes into bases, putting the hole near the top; screw on collar and insert smaller pipe in larger one, lining up holes. Weld aluminum tubes onto top of smaller pipes. Use bolts for height adjustment.



**Cautions:** Two persons are needed to make height adjustments.

**Maintenance:** Clean periodically. Check for cracking or splitting.

**Reference:** Available through MIDLAND.

## Rolling Block

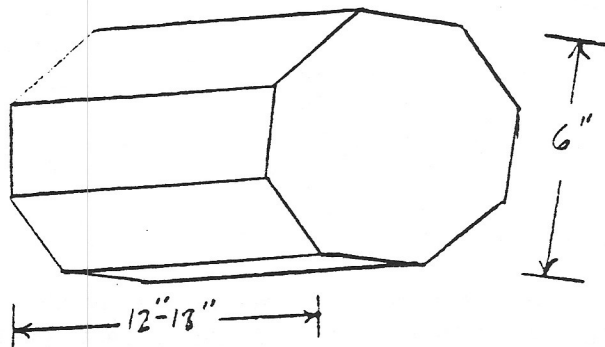
**Purpose:** Used for group games. It will roll, but it won't roll away from the children.

**Suggested Uses:** Small group games, at a table, or on the floor.

**Materials:** 6" x 6" lumber, 12" to 18" long.

### **Construction/Design:**

Saw the elongated cube to make 8 sides. File or sand edges until smooth. Paint each surface a different color or give each a different number.



**Cautions:** This toy may be used in an aggressive fashion.

**Maintenance:** Check surfaces for splinters and rough edges.

**Reference:** Robinault, 1973.



### Scooter Boards

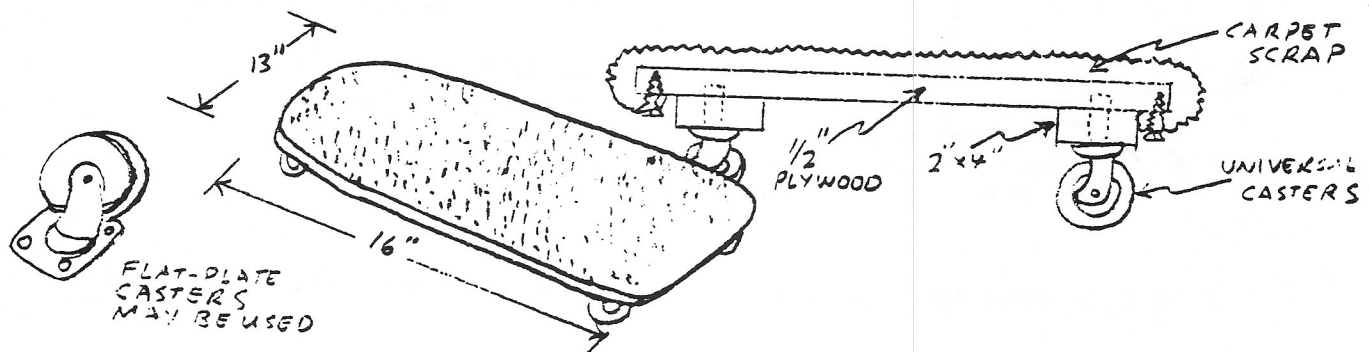
**Purpose:** Facilitates upper body muscle development. Also can be used as an ambulatory aid for severely involved children.

**Suggested Uses:** P.E. time.

**Materials:** 1/2" plywood, 16" x 13", covered with carpet remnants; 4 wheels with universal casters, 2 2" x 4" pieces 12" long.

#### **Construction/Design:**

Attach 12" pieces to underside of board with screws, drill holes in 2 x 4's to match casters. Insert casters in holes.



**Cautions:** Scooters are potentially hazardous - if children stand on scooters, falling is likely.

**Maintenance:** Check wheels for foreign materials occasionally.

**Reference:** Equipment Shop.

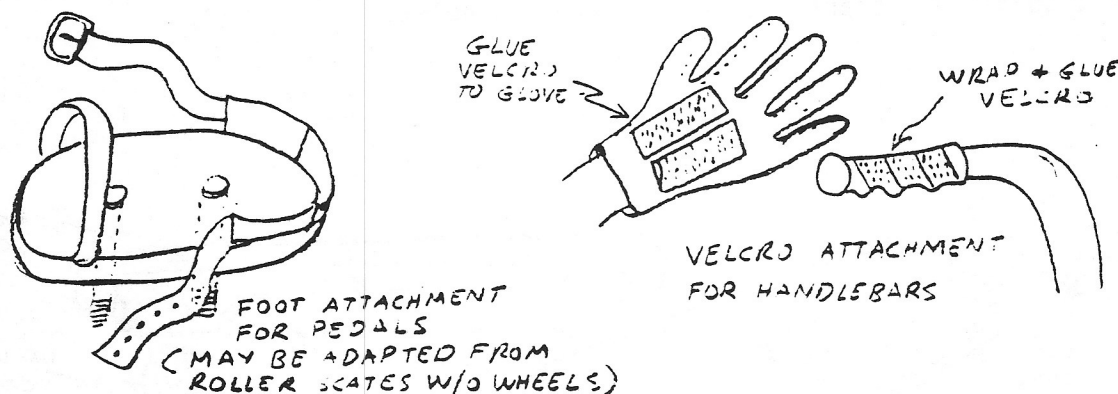
## Tricycle Adaptations

**Purpose:** Mobility, exercise, play.

**Suggested Uses:** During free play and gross motor development sessions. To aid in muscle building and coordination.

**Materials:** A tricycle the appropriate size for the child; foot attachments for pedals; straps for feet; extra back support for seat. Velcro on handlebars and on gloves to fit child.

### **Construction/Design:**



Foot attachment could also be a strap-on roller skate without the wheels.

**Cautions:** If child lacks trunk control, don't leave unattended. Should use only when supervised.

**Maintenance:** Check places of attachment for loose nuts.

## Waterbed Trampoline

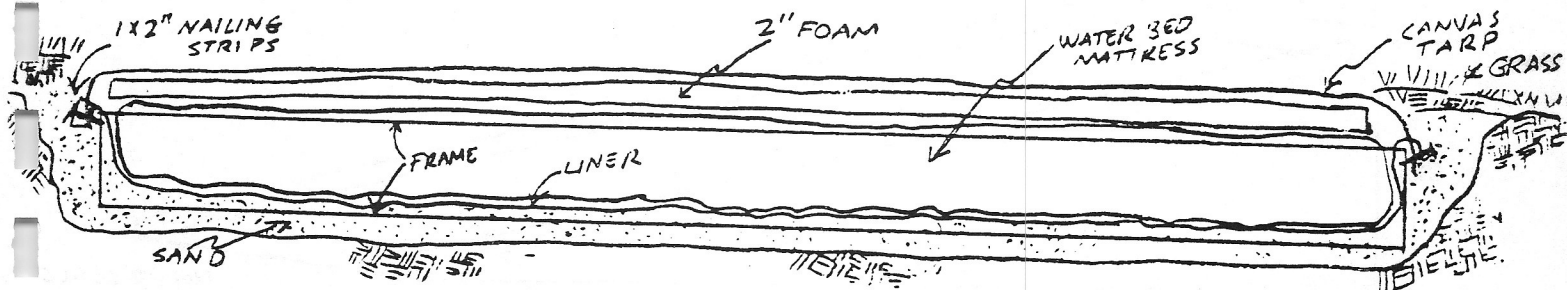
**Purpose:** Allows young children to bounce for fun and to develop leg strength. Also improves balance.

**Suggested Uses:** Playground for preschool children.

**Materials:** King-size waterbed; redwood waterbed frame; sand; foam insulation; heavy duty canvas.

### **Construction/Design:**

Dig a hole in the ground slightly larger than the dimensions of a king-size waterbed. Put the frame in the hole, then some sand. Next put the waterbed liner (heavy duty) in, then the waterbed mattress. Fill the mattress. Cover the top edges of the frame with 2" foam. Then cover the whole mattress and frame with heavy waterproof canvas. Fasten the canvas to the outside of the frame with 1" x 2" nailing strips. Replace the soil around the outside of the frame; replace the sod on top.



**Cautions:** This "trampoline" should be tough enough for preschoolers, but could be abused by larger children.

**Maintenance:** Occasionally remove cover and check water level and algae content. Wipe vinyl with protectant designed for vinyl/plastic surfaces.

## Wooden Slide

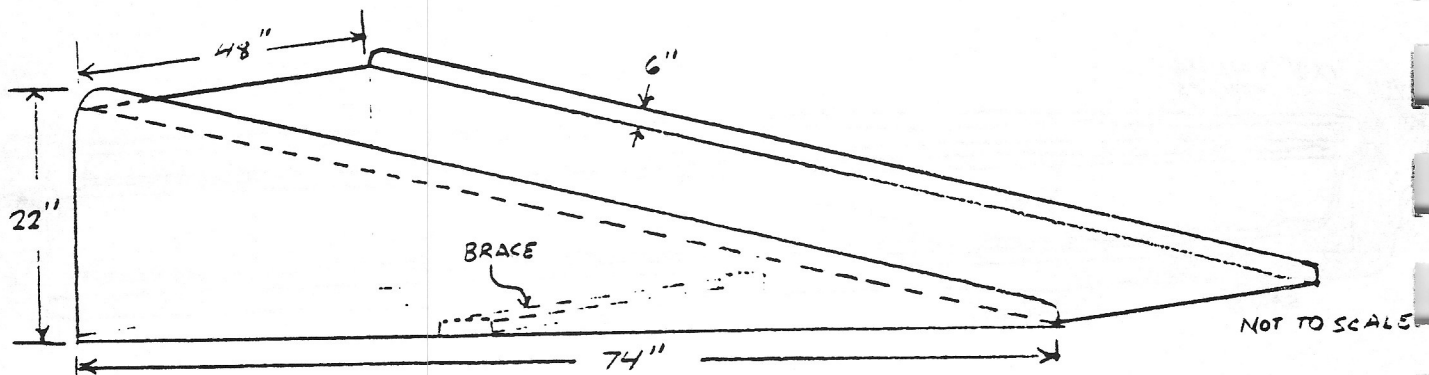
**Purpose:** Slanted surface facilitates balance and gross motor skills through use of wheeled equipment.

**Suggested Uses:** In a P.E. setting with scooter boards. Place child prone on scooter board and have him go down the slide on the scooter board.

**Materials:** All from 3/4" plywood: 1 piece 17" x 48" (vertical end piece); 1 piece 75" x 48" (bed of slide); 2 pieces 74" x 22" (sides) cut; 1 piece 8" x 48" (brace underneath).

### **Construction/Design:**

Nail bed of slide to side pieces, leaving a 6"-7" lip on the side pieces. The slide should touch the ground at the bottom. Secure with the vertical end piece and underneath brace. Nail and glue all seams. Paint or varnish all surfaces. Apply carpet remnants to bottom surfaces.



**Cautions:** Children should be supervised during use.

**Maintenance:** Watch for splinters on edges of material.

### Junior Wall Bars

**Purpose:** Facilitates development of muscle strength and control, balance, and mobility.

**Suggested Uses:** If your child has been advised to do exercises at home, this may be one of the pieces of equipment your therapist would like you to make. Before going any further, make sure that the wall it is to be fixed on is solid enough to hold screws.

**Materials:**

Sides, 2: softwood such as floor boards 1" x 6" x 36"

Bars, 5: strong wooden dowel about 1" diameter by 18" long

Metal brackets, 4: these can be cut from 1/8" x 1-1/2" angle iron or angle aluminum. They should be about 1-1/2" long and have a hold drilled in each side to take the screws that hold the bars to the wall.

Molly screws, 8

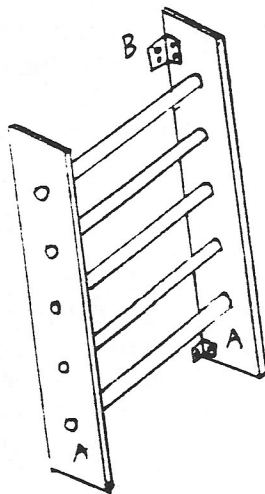
**Construction/Design:**

1. Temporarily nail sides A together, so that holes in each side will align.
2. Mark the position where the holes have to be drilled. The first hole is 6" from the top, and the other four are 6" apart on the center line.
3. Drill holes. These must be a good fit for the bars, so be sure to use a bit of the correct size.
4. Cut the bar to length, and glue in position. Before the glue dries, make sure that the sides are square and parallel.
5. Fix the four brackets B to sides A.
6. Prepare the wall by drilling a hold to take a molly screw. The molly screw provides greater strength and holding power than a simple screw would. However, if the width of the aid is such that you can drive the screws through to the studs, it is not necessary to use molly screws. Ordinary screws 1-1/2" to 2" long will suffice. If attaching the bars to a brick or cement wall, first drill a hold to take a wooden or plastic plug into which ordinary screws can be driven. Never screw directly into a brick, plaster, or cement wall.

**Cautions:** Never leave child alone when using this device as it is potentially dangerous. Make sure dowels are securely fastened and that bars are fixed to a solid wall. No rough wood edges should be exposed.

**Maintenance:** Check frequently to be sure device is safe, clean regularly, and watch for rough and/or weak spots.

**Reference:** Caston, 1982.



## Toy Hanger

**Purpose:** Simple aid can play an important part in the young handicapped child's development.

**Suggested Uses:** Toys can be hung on the plastic tubing at exactly the correct height and distance from the child. Because the base board can be so thin, the child can lie comfortably under the hoop, or be sat in front of it. Several pieces of plastic tube can be provided, each with different toys attached, to maintain interest.

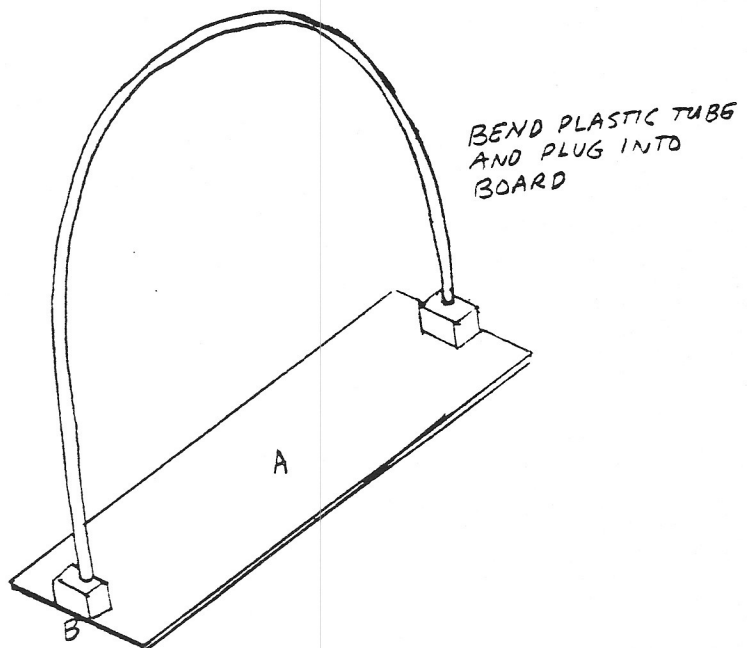
### **Materials:**

Base board: plywood  $1/4"$  x  $6"$  x  $24"$   
End blocks, 2: softwood  $1-1/2"$  x  $1-1/2"$  x  $2"$   
Stiff plastic tube:  $4'6"$  x about  $3/4"$  diameter  
Tape

### **Construction/Design:**

Nail and glue.

1. Carefully round all corners and edges of base board A.
2. Carefully round all corners and edges of the end blocks B.
3. Drill a hole in each block, to be a close fit for the plastic tube.
4. Bend plastic tube and push into holes. Do not use any glue.
5. Hang toys on tube. These can be kept in place with a little Scotch tape.



**Cautions:** Be sure no rough edges are exposed.

**Maintenance:** Regularly clean toys with disinfectant.

**Reference:** Caston, 1982.



## Toy Fence

**Purpose:** Toy fence will keep toys from rolling out of reach.

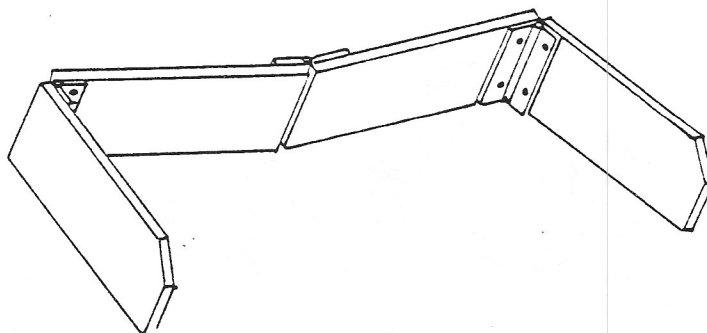
**Suggested Uses:** Helpful in all of child's play settings.

### **Materials:**

Walls, 4: plywood 1/4" x 3" x 16"  
Hinges, 3: 3" butt hinges  
Screws to suit hinges and thickness of plywood  
Bright colored paint  
Foam padding (optional)  
Washable vinyl cover (optional)

### **Construction/Design:**

1. Prepare plywood so that there are no sharp corners. Cut off the corners of the two end pieces as shown on the drawing.
2. Screw the hinges in place according to the drawing. Be sure to countersink the screws. Note that the middle hinge is fitted on the outside so that the fence will fold flat.
3. Paint the fence in a very bright color so that it can easily be seen.
4. A cover of foam padding with vinyl on top can be glued on, if desired, to prevent injury if child should fall against the toy fence.



**Cautions:** Be sure to cover top of fence as described above if child is prone to falling. Remove all rough edges and be careful child's fingers do not get caught between the wood sections when they are opened up.

**Maintenance:** Keep clean, check for rough spots and/or loose screws.

**Reference:** Caston, 1982.

## LEISURE, EXERCISE, MOBILITY

### APPENDIX

**Walkers** -- To help stabilize a walker, hang hand weights on the front cross bar of the walker. A large buggy or plastic toy shopping cart, weighted with sand bags, works well as a walker.

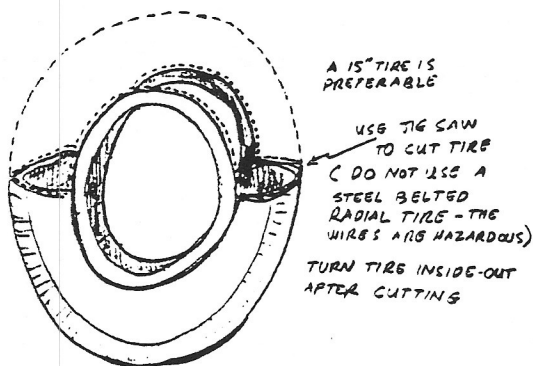
**Ice Skating** -- To help maintain balance while learning to ice skate, have skater push a chair in front of them on the ice. It works like a walker.

**Roller Skating** -- Strap-on skates with plastic wheels don't roll as fast as roller rink skates.

**Shuffleboard** -- Game works well for individuals in wheelchairs; they can still participate.

**Slide Set in the Side of a Hill** -- This allows children to use a slide without the worry of them falling from the top of the ladder.

**Tire Swing** -- Cut away shaded area of tire, turn remaining part inside out. Hang from tree branch or ceiling bars with straps or rope. Pillows inside make it more comfortable.



**Jungle Gym** -- Available through recreation equipment suppliers.

**Plastic Cones** -- Versatile items that can be used for many different games or activities such as obstacle courses.

**Tactile Bins** -- A collection of many different surfaced and textured items,

kept in a basket or tub, can be readily available for tactile stimulation. Items may include carpet scraps, nylon net, flannel, dycem, sandpaper, brush, cup, aluminum foil, etc. Smaller individual containers could hold beans, noodles, rice, etc.

### Musical Instruments:

#### **Maracas -- Construction:**

1. Use a small can from Kodak 35 mm film (used in Leica and similar 35 mm cameras). Drill hole in the lid of the can, to take a screw.
2. Into the end of a piece of 1/4 inch doweling, which will make the handle, drill a screw hole, using a fine drill to prevent splitting.
3. Screw a small round-head screw from the inside of the lid into the handle.
4. Sand and shellac the handle.
5. Fill the can with about 12 BB shot and screw the lid on.

#### **Jingle Bells -- Construction:**

1. Remove all bristles from the wire frame of a vegetable brush and paint the handle.
2. Attach six Christmas trimming bells to the wire frame with picture frame wire.

#### **Rhythm Sticks -- Construction:**

1. Cut a broom handle into 10- or 11-inch lengths. Smooth the ends with a file or sandpaper.
2. Paint each pair of sticks a different bright color.

#### **Drums -- Construction:**

1. Remove the top of a No. 10 can (the type in which canned foods are supplied to restaurants and schools). Be sure to use a smooth can opener. Leave the bottom on the can.
2. Paint the can a bright color.
3. Stretch thin inner tubing or discarded drum hides from school band instruments over the opening of the can and tie tightly with strong cord.
4. For drumsticks use 2 pieces of 1/4 inch doweling 8 to 10 inches long.
5. Scoop out the hole in a rubber ball washer (called Fuller balls) to fit the end of the doweling. An alternative drumstick can be made from a Tinker Toy stick and a knob from a drumstick.

#### **Triangle -- Construction:**

1. Take a piece of thin, solid, metal tubing, such as an old curtain rod, to a welding shop and have a 6- to 8-inch piece of the rod

- filed off for a stick. Have the remainder bent into an equilateral triangle with sides approximately 6 inches.
2. Attach ribbon or braided yarn to the triangle for a handle.

**Cymbals -- Construction:**

1. Punch holes into old pan lids to hold straps (one for each lid).
2. Thread leather strap through from the top and secure it on the underside.

**Jingle Clogs -- Construction:**

1. Cut 3/4 inch plywood or solid wood with a power saw into a banjo or shovel shape, 3" x 8".
2. Sand and shellac the paddle.
3. Attach four metal washers to the paddle with a galvanized roofing nail with a large head. The metal washers should be of two sizes. The hole of the smaller size should be smaller than the head of the nail and at least one of these should be placed next to the nail head to hold the others in place. Leave the nail head protruding enough so that the washers will be loose.

**Tambourine -- Construction:**

1. Drill four holes into the top of a round metal lid from a cookie or candy box. Holes should be 1 inch from the edge of the lid.
2. Drill out the centers of eight roofing caps (shingle tins) so they will slide loosely on copper rivets.
3. Fasten the tins to the lid with four copper rivets and their washers. Place two tins and a washer on the rivet, insert into the hole, and pound the rivet with a hammer so it spreads out and is secure over the hole.

**Sand Blocks -- Construction:**

1. Make two blocks to be rubbed together. Each is approximately 1 inch by 3 or 5 inches. Sand and paint or varnish the blocks.
2. Attach a piece of coarse sandpaper, 5 by 5 inches, to each block with a hand stapler.
3. Staple or nail a leather or rubber strip to each block for hand straps. Be sure the straps are loose enough for little hands.

**SECTION V**  
**Academic Training**



## **OVERVIEW**

This section addresses the area of academic training. A diversity of equipment, modifications, and adaptive devices are discussed and illustrated in this section. Most will help the student accommodate to the pre-academic and academic demands of the classroom. Following is a list of the items covered in this section:

### **Page Turners**

- Dowel and Magnet Page Turner on Headband
- Washer Attached to Band as Page Turner
- Ball and Suction Cup Page Turner
- Mouthstick Page Turner
- Head Strap

### **Writing Instrument Modifications**

- Sarong Pencil Holder
- Sponge Ball Pencil Holder
- Dowel Pencil Holder
- Mouthstick Pencil Holder
- Pencil Grips
- Weighted Pen
- Magnetic Letters
- Wrist Hold Down

### **Modifications to Work Areas/General Environment**

- Door Knobs
- Puzzle Knobs
- For Visually Impaired

### **Adaptive Pointers**

- Wrist Strap Pointers
- Dolphin Pointers
- Mouth Stick Pointer (see Page Turners)
- Head Pointer (see Page Turners)

### **Key Board Expanders/Extenders**

## **Lighting and Auditory Modifications**

Colored Acetate Filters

## **Book Modifications**

.. Book Holder/Stand

## **Lap Trays**

### **PURPOSE**

The purpose of this section is to provide caregivers the skills and knowledge to adapt and construct equipment that will assist in the acquisition of academic skills. The use of this type of equipment should facilitate the functional independence of the individual who has limitations and decrease the amount of direct one-on-one care that is required of the caregiver.

The equipment presented in this section was selected on the basis of ease of construction, availability of materials, and frequency of use in an academic environment.

The equipment will be most beneficial to people who have physical handicaps such as cerebral palsy, hearing impairments, vision impairments, communication impairments, and any other condition that may interfere with the acquisition of academic skills.



### Dowel and Magnet Page Turner on Headband

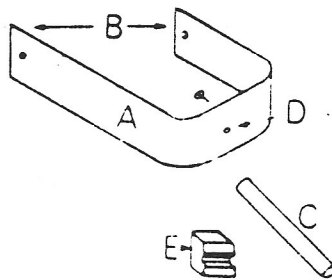
**Purpose:** Permits the turning of pages with head movements.

**Suggested Uses:** For academic and leisure activities.

**Materials:** A simple page turner on a headband can be easily made. It consists of an aluminum band, fastened to the head with elastic. A dowel attached to the band has a magnet page turner on the end. Paper clips or other small metal pieces are attached to each page near the outside center. Useful for this purpose are the metal clips with colored tabs that are used on file cards. As the magnet contacts the metal clips, the page is picked up; the user then completes the operation by a right-to-left motion of the head.

#### **Construction/Design:**

1. Cut a band (A) of thin aluminum 2 inches wide and 12 inches long.
2. Bend the band to a "U" shape, and drill a hole at each end (B).
3. Attach a wooden dowel (C), 1/2 inch in diameter and 6 inches long to the band by a small screw. The screw hole (D) must be countersunk to make the screw level with the inside surface of the band.
4. To the other end of the dowel, attach the magnet (E) by a screw soldered to the magnet.
5. Pull a double strip of elastic through the holes (B) in the headband to hold it securely. The inner surface of the band can be lined with 1/4-inch sponge rubber or moleskin for greater comfort. A piece of stockinette sewed around the band covers the sponge or moleskin and provides friction so that the band stays in place on the forehead.



**Cautions:** Precaution--If the stick is adapted for writing or painting, check with an eye doctor for visual field and focal point of wearer.

**Maintenance:** Be alert to any loose parts of the apparatus that may poke user in head or face.

**Variations:** Wand and suction cup page turner on headband. A suction cup can be attached to a plastic wand, which can then be slipped onto headband and fastened.

**Reference:** Rosenberg, 1968; Lauretana and Liepmann, 1957; Robinault, 1973.

### Washer Attached to Hand or Arm Band Used as Page Turner

**Purpose:** Allows for independent turning of pages.

**Suggested Uses:** May be used for academic and leisure activities.

**Materials:** Hot glue gun, Velcro strap, soft rubber washer, magnet/magnetized washer, paper clips.

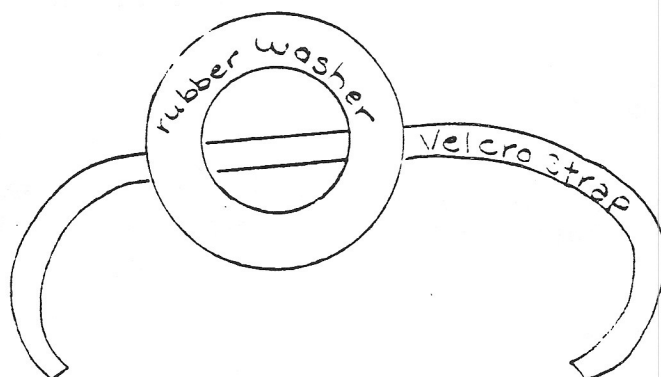
#### **Construction/Design:**

A soft rubber washer attached to a band that straps to the wrist or elbow could be used for the person with poor hand use. Or a metal washer that has been magnetized could be sewn or hot glued to a band and used to contact paper clips or metal tabs attached to the page.

**Cautions:** None.

**Maintenance:** Watch for fraying of the Velcro strap or for the washer to become dry and brittle, needing to be replaced.

**Reference:** Lauretana and Liepmann, 1957.



## Ball and Suction Cup Page Turner for Hand Use

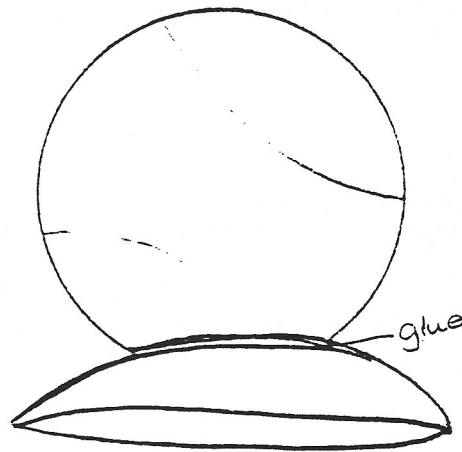
**Purpose:** The person with limited ability to grasp can use a sponge rubber ball to which a suction cup or half hollow rubber ball is attached to turn pages.

**Suggested Uses:** May be used in academic or leisure activities where pages or paper need to be turned.

**Materials:** Hot glue gun, rubber ball, sponge ball.

### **Construction/Design:**

Cut the rubber ball in half and hot glue the round side to the sponge ball (nerf ball).



**Cautions:** Check for rough edges.

**Maintenance:** Wash frequently to prevent transmittal of disease. Check glue to be certain it holds. Materials may become brittle over time.

**Reference:** Robinault, 1973.

### Mouthstick Page Turner

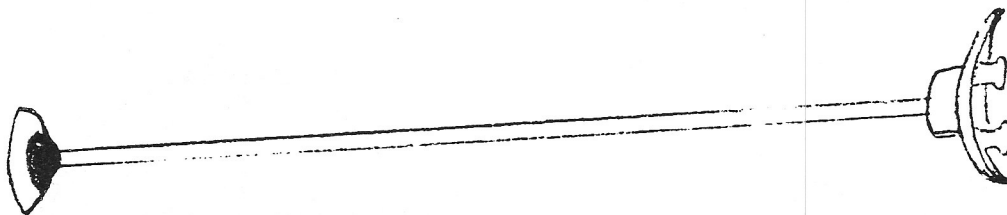
**Purpose:** A handy mouthstick for turning the pages for a book is specially designed to help prevent damage to the teeth, which can occur following long-term use of such a stick.

**Suggested Uses:** Can be used for academic and social activities.

**Materials:** The mouthpiece of a snorkel tube is applied to one end of a lightweight, aluminum tube. A suction cup attached to the other end grasps the page. Vinyl, acrylic, and liquid latex have also been used to construct the mouthpieces on mouthsticks. The aluminum tube may be replaced with a lightweight dowel.

#### **Construction/Design:**

1. Hot glue a suction cup or magnet to the bottom of the tube.
2. Hot glue a snorkel mouthpiece or a plastic cigar tip to the top of tube.



**Cautions:** Watch for signs of loosening joints or brittle materials. All surfaces should be smooth. Use of a can or cup to put the stick in when not in use, so user can reach it easily.

**Maintenance:** Wash after every use.

**Variation:** Magnet mouthstick page turner. Instead of a suction cup, a small cylindrical magnet can be used. On this stick, the magnet is attached with a plastic tube bracket or a fiber sleeve. Paper fasteners are placed on each page of the book to be read, and the magnet lifts the page when it touches the fastener.

## Head Strap for Mounting Pointer or Page Turner

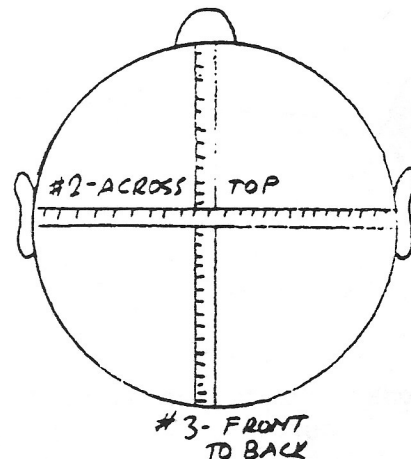
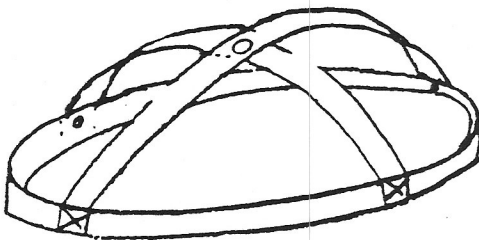
**Purpose:** Permits an individual with limited use of their limbs to participate in daily communicative, educational, leisure, and social interactions.

**Suggested Uses:** May be used to point, sort, type, write, paint, play games, and other tasks.

**Materials:** Grommets/grommet setter or hot glue stick/hot glue gun; webbing, 1 inch wide; tape measure; duct tape; pencil; razor blade; matches.

### **Construction/Design:**

1. Measure circumference of head, across the top of head from ear to ear, and from back of head to front of forehead.
2. Cut 3 pieces of webbing to match the measurements.
3. If the webbing is synthetic, seal the raw edges with a match.
4. Tape the webbing into headband to adjust fit before permanent assembly.
5. Once a comfortable fit is established, use the glue gun or grommets to assemble the head strap.



**Cautions:** Grommets should be mounted carefully and possibly covered so as not to rub the skin. Watch for redness of skin.

**Maintenance:** Wash head strap occasionally.

### Sarong Pencil Holder

**Purpose:** Allows for independent/semidependent use of a writing instrument.

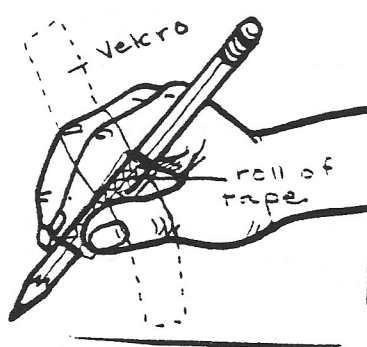
**Suggested Uses:** May be used for academic, social or domestic activities.

**Materials:** Roll of adhesive tape, pencil/pen, Velcro strap.

#### **Construction/Design:**

A commercially available holder is made of Velcro. The tape encapsulates the pencil, then wraps around the fingers and thumb to hold the pencil at the correct writing angle. It will not slip off, yet it is comfortable over long periods of time. It comes in a pleasant beige and brown color combination.

1. Secure the pencil into the roll of adhesive (medical) tape.
2. Place the roll into the hand of the user in the regular pencil grasp.
3. Wrap Velcro strap around the third and index fingers and thumb and secure.



**Cautions:** Watch for signs of chafing or tightness of the strap.

**Maintenance:** Wash the Velcro strap in warm soapy water to clean. Rinse well. When the pencil becomes loose, cut the tape and reattach the pencil with a fresh piece of tape.

**Reference:** Fred Sammons, Inc. catalog.

## Sponge Ball Pencil Holder

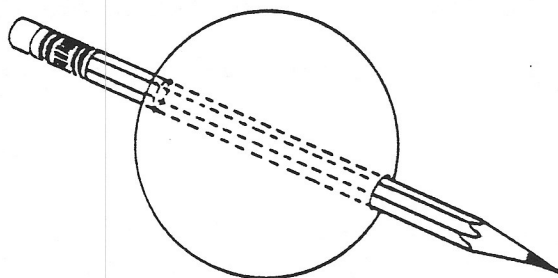
**Purpose:** Allows for independent or semidependent use of a writing instrument. For children who need strengthening of grasp, since the sponge offers some resistance.

**Suggested Uses:** May also be used to hit the keyboard of a typewriter or computer.

**Materials:** Pencil/pen, sponge ball approximately 1-1/2" inches.

### **Construction/Design:**

1. Squeeze the ball as flat as possible.
2. Work the sharpened end of the pencil into and through the flat ball.
3. Once the pencil is in place, allow the ball to regain its shape.



**Cautions:** Make sure the point on the pencil is not too sharp.

**Maintenance:** Wash ball in soapy water, rinse well, and allow to dry thoroughly. This will keep the ball clean and prevent it from becoming dry and brittle.

**Reference:** Copeland, Ford, & Solon, 1976.



### Dowel Pencil Holder

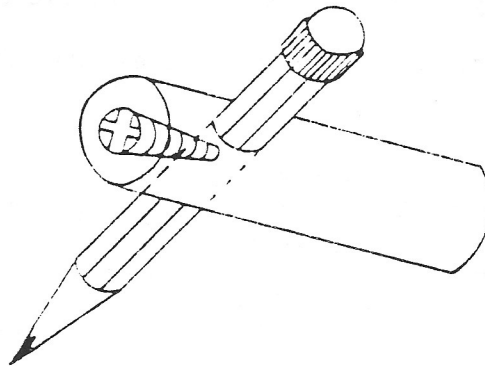
**Purpose:** Allows for independent/semidependent use of a writing implement.

**Suggested Uses:** For academic, social, or leisure activities. Can also be used to strike the keyboard of a typewriter or computer using the eraser end.

**Materials:** Pencil, screw, dowel, drill, screwdriver.

#### **Construction/Design:**

A hole drilled through a piece of dowel will make a satisfactory pencil holder. A screw placed into the end of the dowel will keep the pencil from slipping. The eraser end of the pencil may be used to tap the keys of a typewriter or computer.



**Cautions:** Watch for rough edges on the dowel and be sure that the point on the pencil is not too sharp.

**Maintenance:** Every couple of months, the screw should be checked for tightness and the dowel should be lightly sanded.

**Reference:** Robinault, 1973.

## Mouthstick Pencil Holder

**Purpose:** Allows semidependent/independent use of a writing instrument.

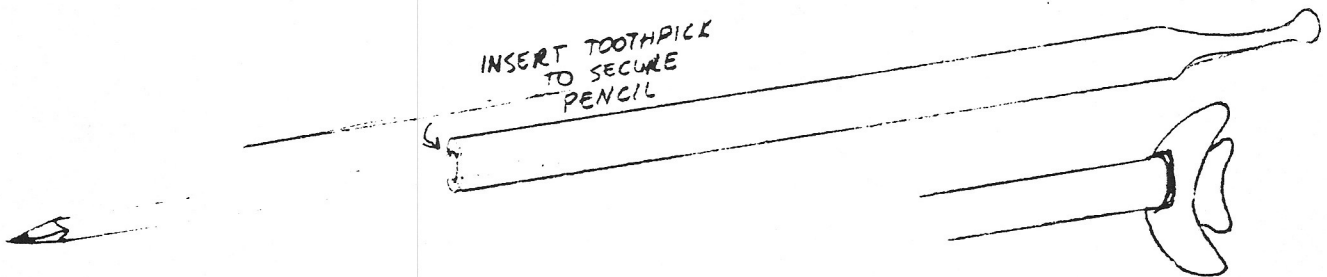
**Suggested Uses:** Can be used for leisure (painting), academic (to strike the keys on a keyboard), domestic activities, and social involvement (to play board game).

**Materials:** 14" wooden dowel, mouthpiece (wind instrument, cigar tip, or snorkel), pencil, paintbrush, pointer, sandpaper, Elmers glue, drill bit 5/16".

### **Construction/Design:**

A 14-inch wooden dowel with a mouthpiece shaped like that of a wind instrument is a useful device for the person without hand use. The distal end is provided with a hole about 5/16 inch wide and 1-1/2 inches deep, into which a pencil, paintbrush, or pointer can be inserted. The center area of the stick can be sanded down to about 3/8 inch to lighten its weight. The stick may also be made out of plastic or nylon material.

Two additional options for the mouthpieces are cigar tips and a snorkel mouthpiece.



**Cautions:** Make sure that all of the sections of the mouthstick are smooth and tightly fastened together.

**Maintenance:** Wash the mouthstick after each use.

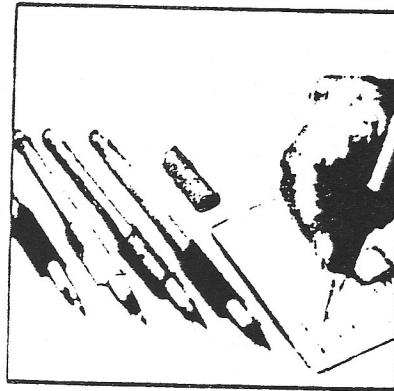
## Pencilgrips

**Purpose:** To achieve a more natural and efficient pencil grip by forming a cushion for the writing fingers.

**Suggested Uses:** Can be used with pens, pencils, crayons, and markers.

**Materials:** Commercially available at most school supply stores.

**Construction/Design:**



**Cautions:** May be bitten into or chewed on by children. Soft and look delightful.

**Maintenance:** Should be washed to prevent transmission of disease.

**Reference:** Preston catalog.

## Splinting Material Pencil Grasp

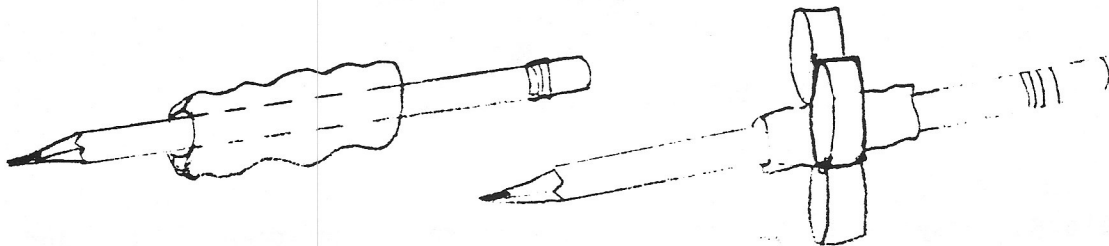
**Purpose:** Individually fits a grasp implement to a student by making it to fit his/her hand.

**Suggested Uses:** For academic and leisure activities where individual needs to maintain grasp on pencil or other straight tool.

**Materials:** Pencil/pen/marker, water-heated splinting material, electric skillet, water, scissors, tongs.

### **Construction/Design:**

1. Heat water in electric skillet to simmering (not boiling).
2. Cut splinting material to 2" by 3" (or bigger, depending on the size of the pencil and hand to be fitted).
3. Heat the splinting material in the water until it is soft.
4. Wrap it around the pencil.
5. Have student squeeze the splinting material to mold it.



**Cautions:** Student should wash hands first or splinting material will pick up any dirt. Make sure the splinting material is not too hot to handle. The splinting material may be reheated if it cools before you are finished molding it.

**Maintenance:** Wash the grip as you would any school equipment to cut down on transmission of disease.

**Variation:** Use three rings made of splinting material and mold them around pencil to provide a three-finger hold grasp (see illustration above).

### Weighted Pen

**Purpose:** Stabilize hands which are slightly tremulous or uncoordinated.

**Suggested Uses:** Useful in any setting that would require a writing instrument.

**Materials:** Commercially available.

#### **Construction/Design:**

Oversized pen or pencil, 8 to 10 grams weight added. Instrument weight can be changed from 5 to as much as 120 grams.



**Cautions:** None.

**Maintenance:** None.

**Variation:** Fat markers.

**Reference:** Preston catalog.

## Magnetic Letters

**Purpose:** Allows for the manipulation of materials on a surface without losing the materials due to tremulous movements. Requires only minimal strength to manipulate.

**Suggested Uses:** Useful for academic activities like composing written words, concept development, color recognition, sorting, matching, and number and letter identification.

**Materials:** Hot glue gun, strips of cuttable magnet, a large metal tray, plastic letters, shapes, objects.

### **Construction/Design:**

Small magnets can be purchased at hardware or department stores. These can be attached by gluing to toys, cardboard shapes, or other various items. Words cut from a page of large type may also be used. The items can then be placed on any piece of sheet metal or steel. Remember, aluminum will not hold magnets.

Magnets can also be placed along the edge of paper to hold it in place for writing or drawing.

A table top or slant board covered with metal provides a useful surfaces for the child's play or school work. In housewares departments, look for magnets shaped like fruits and vegetables. These can be useful for counting, form, and color recognition, as well as for securing paper and other objects.

**Cautions:** Make sure all the materials have smooth edges. Be certain that the magnets are attached securely so that they cannot be swallowed.

**Maintenance:** Check glue every few months.

### Wrist Hold-Down

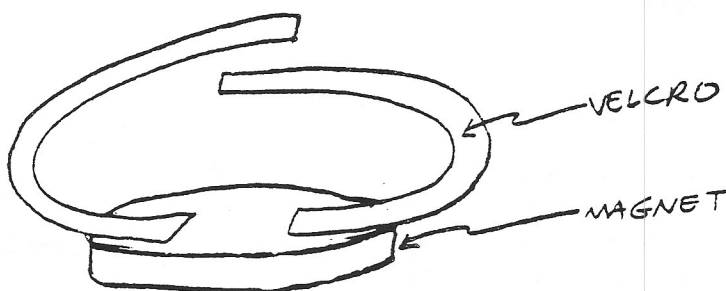
**Purpose:** Stabilizes the wrist, hand, and paper.

**Suggested Uses:** To hold paper in place for academic, leisure, and social activities.

**Materials:** Metal tray, flat round magnet (2-3" diameter), Velcro strap, hot glue gun.

#### **Construction/Design:**

Hot glue the Velcro strap to the magnet.



**Cautions:** Watch for signs of chaffing around the wrist.

**Maintenance:** The Velcro may need to be replaced if the nap wears down.

**Variation:** Magnetic strips may be used to hold the paper to the metal tray. Also, a wrist slot stabilizer (U-shaped trough) can have magnets glued to the underside for additional support.

**Reference:** Preston catalog.

## Door Knobs

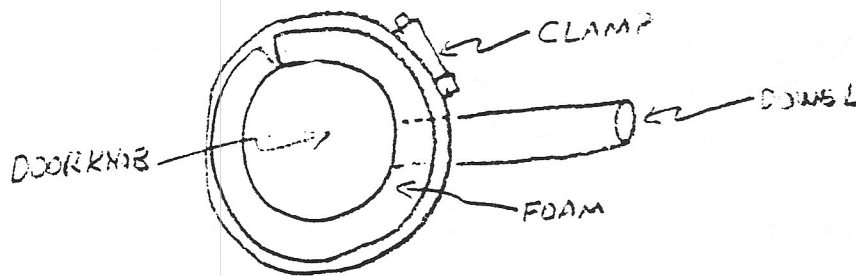
**Purpose:** Increases the independent functioning of an individual.

**Suggested Uses:** Allows an individual to open a door in spite of limited hand use.

**Materials:** Hot glue gun, foam strips, circle clamp, 1-inch dowel at least 6 inches long or a piece of splinting material.

### **Construction/Design:**

1. Hot glue the foam to the inside of the circle clamp.
2. Fix the clamp around the door knob.
3. Clamp the dowel or work a piece of splinting material into place to use as a lever.



**Cautions:** Check for rough edges.

**Maintenance:** Foam may break down and need to be replaced.

**Variation:** Rubber grip jar turner or piece of dycem.

**Reference:** Comfortably Yours; Fred Sammons.



### Large Knobs for Puzzle Pieces

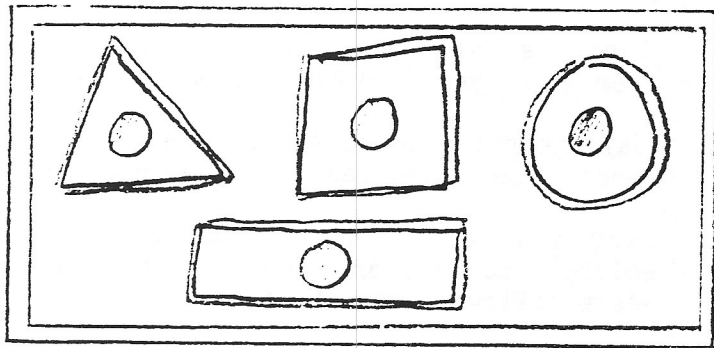
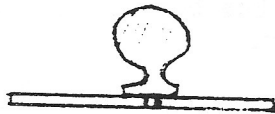
**Purpose:** Allows independent functioning in a leisure time activity.

**Suggested Uses:** Useful for puzzles or other play or leisure materials that need to be picked up or moved.

**Materials:** Wooden knobs with screws available from the hardware store, wood glue, wooden puzzle.

#### **Construction/Design:**

1. Drill hole in center of puzzle piece or object.
2. Screw knob into each wooden puzzle piece or object. Wood glue in the hole may add extra strength.



**Cautions:** Make sure the screw is not longer than the puzzle piece or object or it may poke through and create a sharp edge.

**Maintenance:** May need to reglue and/or tighten after a few months of use.

## For Visually Impaired Students

### **Notetaking/Chalkboard Activities**

1. When the chalkboard is located in the front of the classroom, the front row center is usually a good seat for a visually handicapped child unless lighting is a problem in this location. If demonstrations are given during class, the location of the demonstrations should be taken into consideration when assigning permanent seats.
2. Assign a classmate (or permit the visually handicapped student, especially an older one, to choose his own) to (a) make carbon copies of his notes and lend them to the visually handicapped student, (b) speak the notes aloud as he is copying them (in a low voice).
3. Encourage the visually handicapped child to walk up to or move his chair closer to the chalkboard; help him to position himself so as not to block the view of other students.
4. Lend the child your copy of the notes you put on the board or the book from which you have taken them.
5. Say the notes aloud as you are writing them on the board. The visually handicapped child can take them down as dictation.
6. Lend your notes in advance to the resource or itinerant teacher to enlarge, darken, or braille. This is especially helpful in math class, where following step-by-step instructions is necessary.

### **Demonstrations in Class**

1. Try not to stand with your back to the window. Glare and light will silhouette your demonstration and eye fatigue may occur. (Cutting down on glare will benefit not only the visually handicapped child but the entire class.)
2. Allow the visually handicapped child to stand next to or to the side of the demonstration.
3. Allow the child to assist in doing the demonstration or to handle the materials before or after the observation period.
4. Closed circuit television (if available) may be useful and permit magnification of the demonstration.

### Reproduced Materials, Texts, and Homework

Consult with the resource or itinerant teacher as to the print size and clarity needs of your student. The following suggestions may be helpful when visually handicapped children find reprints unclear or uncomfortable to read:

1. Give copies of reproduced materials to the resource or itinerant teacher to adapt as far ahead of time as possible. It will also be helpful if you give the visually handicapped student his assignments, particularly long-term projects and reports, as far in advance as you can. This will allow for any special ordering of materials or locating of readers.
2. Extra time will frequently be needed to complete assignments and exams. Allowing time and a half is usually considered acceptable. The child may complete his work in the resource room or school library. When you are certain that the child understands the work, it may be a good idea to shorten his assignments; for example, you may request that a student do only the odd numbered problems in the math homework.
3. Duplications in black ink are usually easier to read. However, if you must use purple, give the original ditto master to the child. This copy is usually darker and more legible.
4. Although you may be using separate answer sheets for the rest of the class, it may be easier for the visually handicapped child to answer directly on the test.
5. A classmate or resource or itinerant teacher may write down the answers given orally by the visually handicapped child. A tape recorder may also be used for this purpose, allowing for more independent responses. Some students will type their answers.

### **Texts and Other Books**

Many visually limited students can use books with regular size type, although they may have to bring the book closer to their eyes and use optical aids or reading stands. As mentioned above, they may also require more time to complete assignments.

### **Seating**

1. Seating should be arranged so that light will fall over the proper shoulder so that pupils do not work in their own shadows or face the light.
2. Pupils should be encouraged to change their seats whenever they desire more or less light.

3. Pupils with eye difficulties should be placed in the best lighted places from the standpoint of their specific needs.
4. Work places should be selected in order to make best use of available light.
5. Preferential seating near the chalkboard or screen should be provided for the child with defective vision.

### **Illumination**

1. Light intensity can be regulated by adjusting distance from the window or light source.
2. Glare can be reduced by using shielding devices such as blinds or shades, and by using pastel colored paints with reflectance values as recommended by the Illuminating Engineering Society.
3. Artificial lights should be used whenever brightness levels become low in any part of the room.
4. The teacher should stand and sit in positions which direct pupils' vision away from the windows.
5. The room and furniture should be designed to allow for individual differences in lighting needs.
6. Illumination levels in all parts of the room should be checked periodically with a light meter.

### **Time**

1. The daily activities of each pupil should be planned to supplement periods of close eye work with less visually demanding activities.
2. Time allowances for reading assignments should be adequate for each child's speed of reading.
3. Tests which have been adapted for large print should be given as power tests without time limits.

### **Maintenance**

1. Lamps or lighting fixtures should be cleaned periodically and repaired or replaced as needed.
2. Windows and chalkboards should be cleaned frequently.

3. Walls, ceilings, floors, and furniture should be cleaned and redecorated in colors with proper reflectance values.
4. Light obstructions such as plants, window decorations, or curtains should be removed.

**Reference:** Corn and Martinez, 1967.

### **Duplicated Material**

1. Purple ditto sheets require high levels of illumination and should be used as little as possible with visually impaired children.
2. If absolutely required, give the child a clear, sharp copy.
3. Legibility is improved by using a good quality of black ink on white paper.
4. Dim areas of the material should be outlined with a felt tip pen.
5. Only one side of the paper should be used.
6. Handwritten ditto should be avoided and large type ditto should be used when possible.
7. The material should be spaced so that crowding will not occur and adequate space is allowed in blanks to be completed.
8. High levels of illumination are needed with duplicated material.

### **Contrast**

1. Chalkboards should be cleaned frequently and kept in good repair.
2. Old books, maps, and other teaching materials that are soiled should be replaced with materials that have nongloss surfaces and desirable contrast.
3. White chalk offers more contrast on a black or green chalkboard.
4. Soft lead pencils and fiber-tipped pens with black ink are recommended for use on unglazed light and tinted paper.
5. The use of good quality typewriter ribbons will help to insure good contrast in typed materials.

### **Size of Print**

1. All board writing should be large and clear and placed in the line of vision of the pupils.
2. Appropriate size of print should be selected to suit the needs of each individual pupil.
3. Optical aids may be used to increase size of image without using large print materials.

### **Aids and Equipment**

1. Copyholder, easels, and desks with adjustable tops should be provided to maintain good posture for close-eye tasks.
2. Books, maps, charts, and posters should be selected with nongloss surfaces, appropriate type size, and desirable contrast.
3. Soiled materials should be discarded and replaced with clean materials.

### Wrist Strap Pointer

**Purpose:** Allows for independent/semidependent use of a writing instrument.

**Suggested Uses:** May be used for academic activities, communication, art, and leisure activities and for social activities such as board games.

**Materials:**

1. 1-1/2" x 8-1/2" strip of imitation leather material.
2. 6-1/2" strip of leather material cut on a taper with a width of 1-1/4" to 1/2".
3. 1-1/4" x 1-3/4" patch of Velcro loops material sewn to outside surface of #1 strip.
4. 1-1/2" x 1-3/4" patch of Velcro hooks material sewn to inside surface of #1 strip.
5. Plastic conduit clamp 1/2" x 1 1/2". Note: Clamp should be attached to #1 strip with "speedy rivets."

**Construction/Design:**

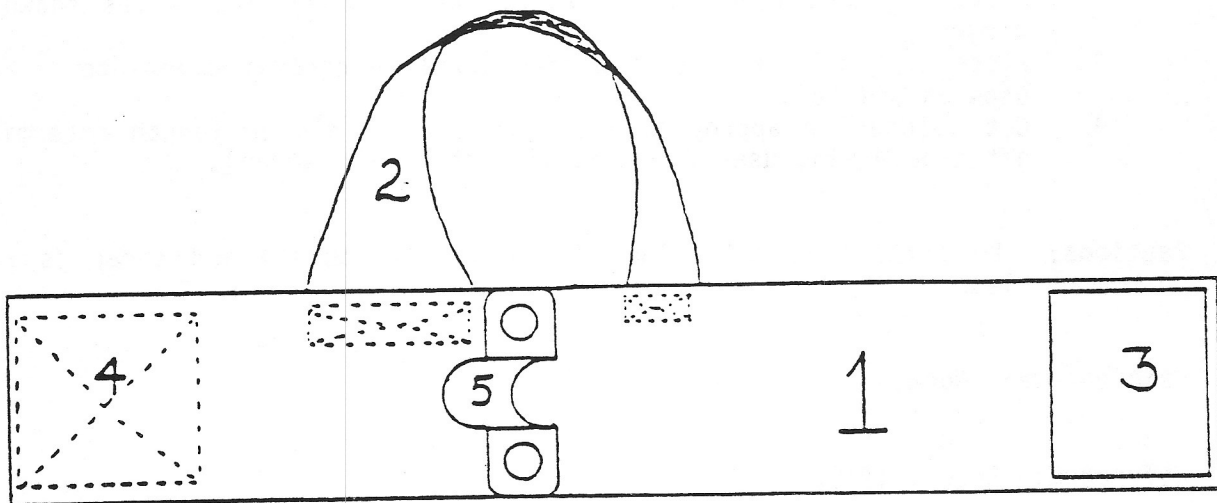
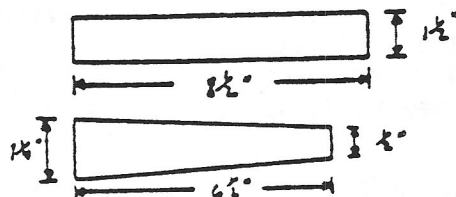
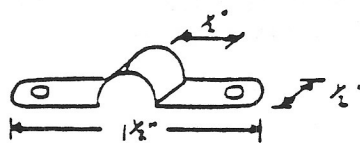
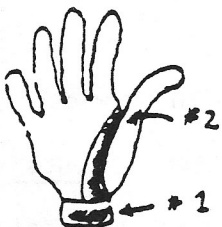
1. Cut parts #1 and #2 out of imitation leather material.
2. Attach Velcro patches to ends of #1 strip.
3. Attach strap to user's wrist.
4. Determine proper location of #2 by placing it around user's thumb.
5. Mark location of #2 strip with magic marker.
6. Sew #2 strip in place.
7. Attach conduit clamp to #1 strip using speedy rivets (as shown in diagram).
8. Place 1/2" x 1" or 1 1/2" wooden dowel in conduit clamp--to be used as pointer.
9. Cut pointer to appropriate length (note: proper length determined after observing user pointing with the wrist strap).

**Cautions:** Be certain conduit clamp is attached securely and strap is kept clean.

**Maintenance:** None.

**Reference:** Brown, 1980.

# Wrist Strap Pointer





### The "Dolphin" Pointer

**Purpose:** Designed for use as an indicator when using a manual pointing board. The design is relatively simple and the materials are readily available at most hardware and fabric stores.

**Suggested Uses:** Can be used for academic activities, communication, or board games.

**Materials:**

1. 1/4" x 5-1/8" x 2-5/6" piece of lexan sheet material.
2. 1/2" x 6-3/4" piece of lexan rod material.
3. 3 strips of 1" x 5-1/2" self-sticking Velcro loop material.
4. Small amount of epoxy glue.
5. Saber saw/hand saw.
6. Heat gun.
7. 1/2" drill bit/drill
8. Rat tail file.
9. Nail polish/enamel.
10. Pencil.

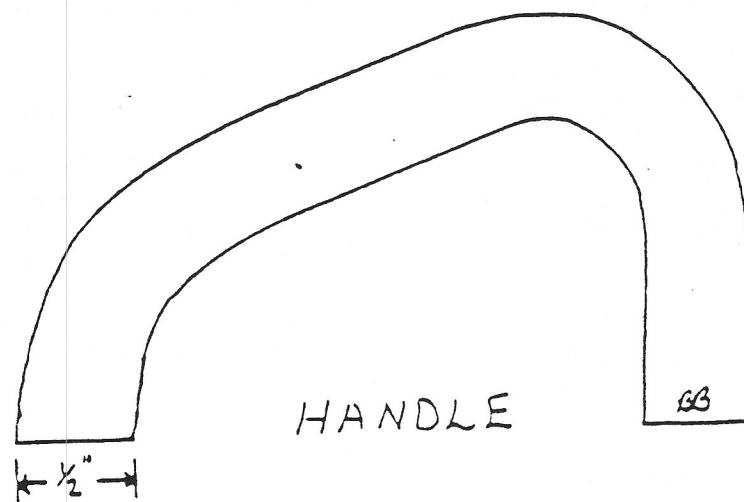
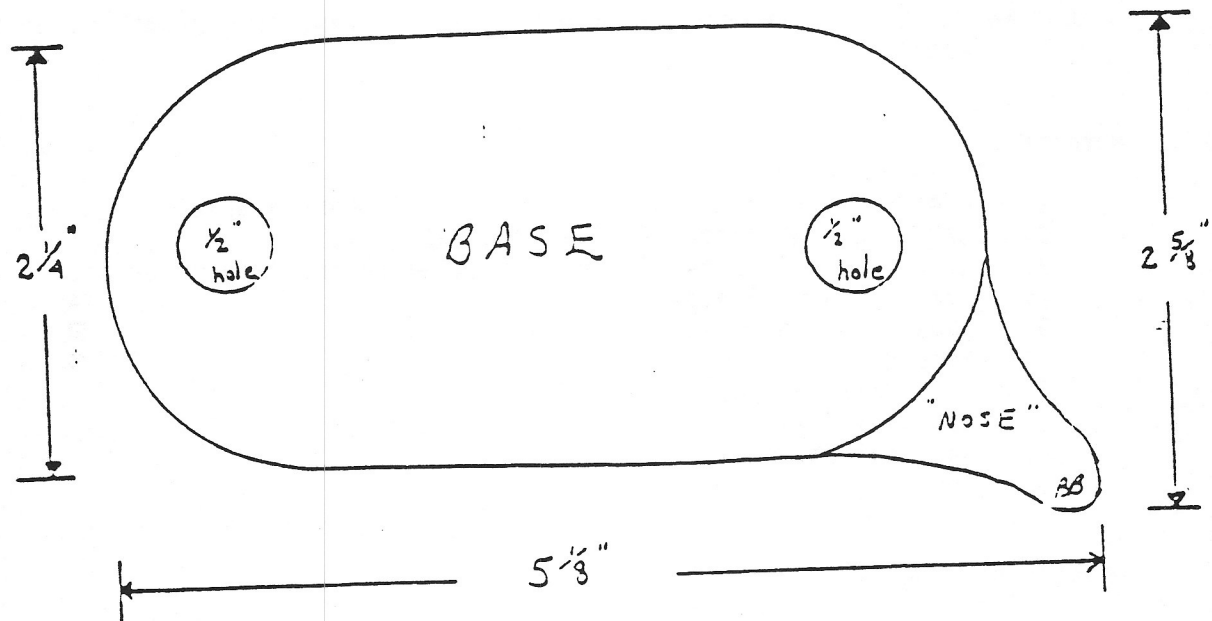
**Construction/Design:**

1. Using the enclosed pattern (or your own design), trace the base on piece of lexan sheet material.
2. Cut out the base using a band or saber saw. (Note: Make sure appropriate blade for cutting plastics is used with the saber saw.)
3. Measure and cut lexan rod material.
4. Using a heat gun, heat and bend lexan rod to appropriate shape. Configuration of handle can be tailored to user's needs.
5. Place handle on base and determine appropriate location for handle anchoring holes.
6. Drill 2 holes through base using 1/2" drill bit--appropriate for drilling through plastic. (Note: If possible, use a drill press set at the slowest speed.)
7. Using a rat-tail file, ream out the holes so handle fits snugly.
8. Before gluing handle in place, decide whether "nose" of pointer will point left or right. Attach Velcro to bottom of the base and trim around the edge. (Note: Velcro will serve as a "floor" for the handle holes when applying the epoxy.)
9. Secure the handle in place with epoxy.
10. Paint the "nose" with enamel (optional) or long-wearing, bright colored nail polish-enamel.

**Cautions:** Check for rough edges.

**Maintenance:** Check for loosening of glue every few months. May need to repaint nose.

**Reference:** Vanderheiden, 1984.



## Keyboard Extender

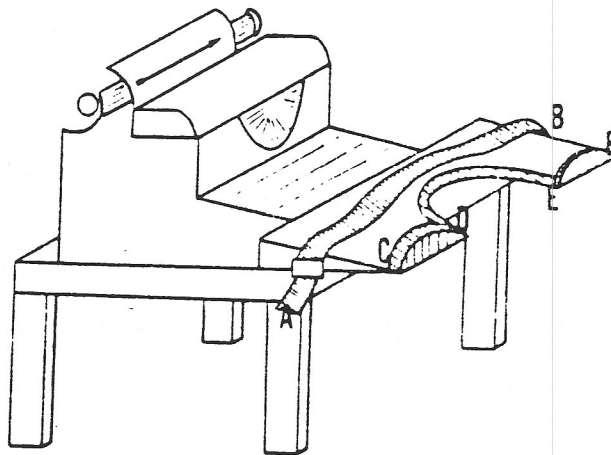
**Purpose:** Helps the typist control arm movement while seated comfortably at the machine.

**Suggested Uses:** Academic activities.

**Materials:** Plywood, saw, sandpaper, webbing/Velcro strap, rubber or foam padding, varnish, brush, hot glue gun or small nails and hammer.

### **Construction/Design:**

1. Cut off the legs of any sturdy table to the desired height for the typist.
2. Add an armrest built at the same angle as the keyboard of the typewriter. The armrest should have a cutout, within which the typist can sit and comfortably rest his arms up to the elbow.
3. Webbing strap or elastic (AB) will give the lower arms full horizontal sweep, while still controlling them.
4. Some individuals may like a web strap or wide elastic just below the elbow (CD, EF) for further security, or padded backstops may be laced at these points to keep the elbows from sliding off the armrests.
5. The typewriter feet may be bolted to the table if a rubber typing mat does not stabilize the machine.



**Cautions:** Check for rough edges.

**Maintenance:** Check for weakness where straps are secured. Padding may need to be replaced.

## Book Holder

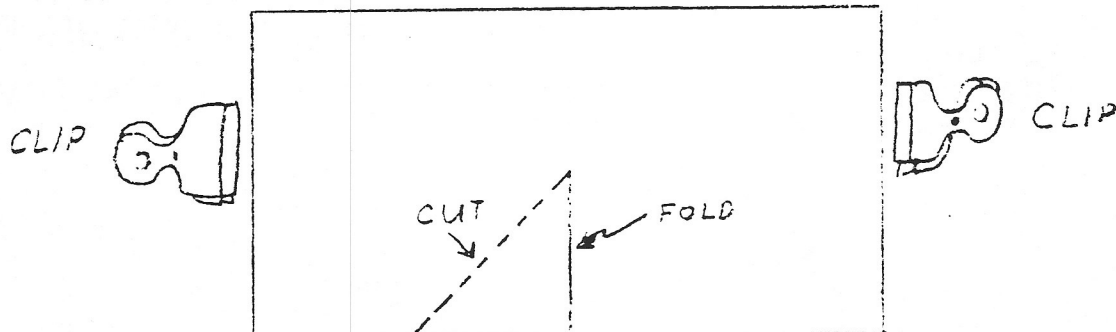
**Purpose:** To allow an individual to read or look at a book without using his/her hands. Will also reduce postural fatigue of the visually impaired.

**Suggested Uses:** Can be used for academics, leisure, or social activities.

**Materials:** Approximately 10" x 16" piece of heavy cardboard, contact paper, ruler, pencil, razor blade, duct tape, 2 large paper clips or clamps.

### **Construction/Design:**

1. Draw a line halfway down the middle of the cardboard.
2. Draw a dotted line from the top of the solid line to the bottom of the cardboard at a 45° angle.
3. Cut the cardboard on the dotted line and fold the cutout back so that the cardboard free stands.
4. Cover the cardboard with contact paper.
5. Use the clamps to hold the book in place on the stand.



**Cautions:** Seal all raw edges with duct tape.

**Maintenance:** This stand is not meant to be permanent and may need to be replaced with something solid like wood or plastic.

## Lap Trays

**Purpose:** To assist in communication, education, eating, and any activity that requires a solid work surface.

**Suggested Uses:** Used to mount a communication system or provides a mobile and removable work surface.

**Materials:** Plywood, plexiglass, can also use masonite, fiberglass, plastic sheets, steel framing, duct tape, safety glasses, pencil, measuring tape, 2 clamps, varnish or polyurethane finish, brush, paint thinner, crosscut or saber saw or coping saw, sandpaper #100-120 medium grain.

**Construction/Design:** See attached design.

## Method B

This method allows the person constructing the aid to select any size for the lap tray and to custom fit the cutout for the particular child. With this method a more general construction drawing is used and measurements are determined individually.

### **Measurement A, B, C**

The width and depth of the actual lap tray area should be chosen using the guidelines discussed here.

Some general guidelines that have been used by various clinicians in determining the size of the lap tray are as follows:

1. Width is equal to or just less than the width of the wheels of the wheelchair--

or width is about an inch or two narrower than the typical doorways through which the child will have to go (that should include that portion of the doorway that is blocked by the door when it's in its open position).

2. The dimension of the board front to back will be about 24".
3. The distance front to back on a lap tray will be approximately equal to the child's reach--

or distance front to back will be equal to or just less than the distance to the child's footrest or feet.

## Measurement D

The size of the body cutout for the child can affect both the stability of the child in his chair and the amount of support which is available to him to stay in an upright position. For this reason, the measurements for "D" should be worked out in cooperation with the PT or OT working with child. In general, the gap will run somewhere between five to eight inches. However, it may be larger or smaller than this if the individual is particularly heavy or small. In general, if there is a doubt about the size of the body cutout, you should start on the small side (usually 4-5"). If more room is required, you can always cut out additional wood to make the gap longer.

## Measurement E

To determine the width of the body cutout (measurement E), you must first know the inside distance between the arms of the wheelchair to be used. To get this measurement you simply take the distance between the inside of wheelchair arms and subtract two inches. For example, if the distance between the arms of the wheelchair were 16 inches for a particular child, then the measurement for E would be  $16 - 2$  or 14 inches. The measurement of the distance between the arms of the wheelchair should be made with the child seated in the chair.

## Using the Measurements

To produce a construction drawing for the lap tray, fill in the values for A, B, C, D, and E on the diagram. The size of plywood needed will be  $A \times C \times 3/8"$ .

## Cutting Procedure

**Caution:** Wear safety glasses at all times.

**Step 1:** Obtain correct rectangular size for the lap tray.

The lumberyard will cut your plywood piece to size at a minimum charge for each cut made. Cutting the piece yourself with a crosscut saw or an electric hand saw will result in some variation from the measurements desired. If you are careful, though, this variation may be small enough not to affect the lap tray overall.

**Step 2:** Cut outer edges and the body cutout.

Brace or clamp (C-clamp or wood clamp) the plywood to the work area to prevent it from slipping while you are cutting.

**Step 3:** Cut out arm areas.

Brace or clamp the plywood to the work area to prevent it from slipping while you are cutting. Use the coping or electrical

saw. If "binding" (i.e., saw sticks or jams) occurs, it may be necessary to notch the area in much the same way as you did in Step 2 for the body cutout area. Round off all corners when you finish the main cutout area.

When you are finished with the rough cutting, the lap tray should be tried with the child to check for final adjustments. If the child is able to wheel his own chair it may be desirable to double-check the side cutouts to be sure they allow him proper access to the wheels.

**Step 4:** Sand all cutout areas.

Sand all areas of the plywood which have been cut. Be careful not to run into splinters. When finished, these areas should be smooth enough that you can run your fingers over them without feeling any roughness.

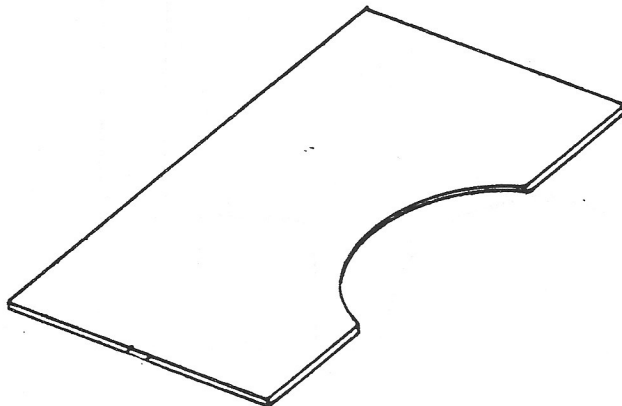
**Step 5:** Varnish.

Varnish the lap tray according to directions on your can of varnish.

**Cautions:** OT, PT, SLP should be involved in design. Proper positioning is important.

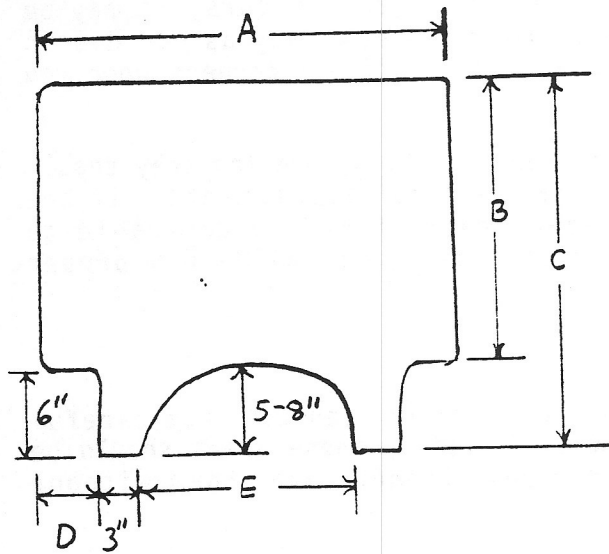
**Maintenance:** Occasional sanding or revarnishing, replacement of cover.

**Reference:** Vanderheiden, 1977.



Variation: Use chalkboard material to cover the lap tray; so that the student may work right on the tray with chalk.

# MODEL PATTERN



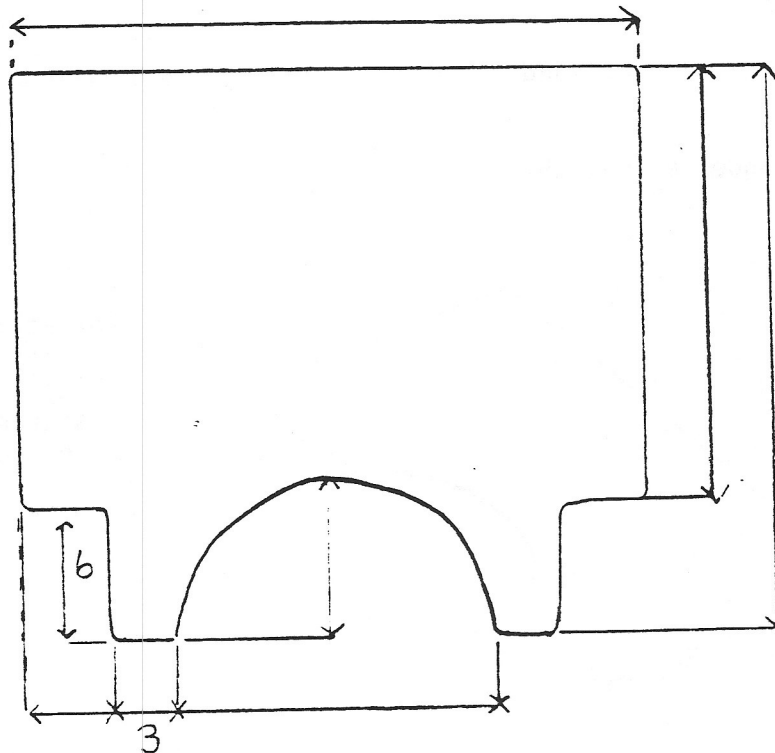
## Summary of Measurements

A \_\_\_\_\_  
 B \_\_\_\_\_  
 C \_\_\_\_\_  
 D \_\_\_\_\_  
 E \_\_\_\_\_

Size of Plywood Needed:

A inches (width) x C inches (length)  
 x 3/8 inches (thickness) = size

Transfer Construction Information  
 To The Pattern Below



Construction Pattern for Laptray: Vanderheiden, 1977



### Colored Acetate Sheet Filters

**Purpose:** Permits a visually impaired person to have the maximum use of his/her vision. Tends to darken the print and heighten background contrast.

**Suggested Uses:** Academic or leisure activities.

**Materials:** 8 colors of clear acetate, 8" x 10"; water washable markers; clipboard.

**Construction/Design:**

1. Put a worksheet on the clipboard.
2. Cover the worksheet with all of the colors of acetate one at a time until the student determines which he/she can see best through. -

**Cautions:** Edges of acetate may cut user if pushed around.

**Maintenance:** Acetate will have to be replaced two or three times a year.

**Reference:** Corn & Martinez, 1967.

The items listed here do not require construction and are commercially available.

Some children may need only a few adaptive materials while others require a combination of several devices. These devices are generally categorized as optical or nonoptical. Optical aids should be recommended by an eye specialist. A partial list follows.

**Nonoptical Aids** - These are devices that are not individually prescribed and may or may not be designed specifically for the visually handicapped. Most are commercially available.

A. Visual Aids

1. Bookstands - These help to reduce postural fatigue by bringing the work closer to the reader's eyes. When a bookstand is not available, one may be improvised by placing other books beneath the book that is to be read.
2. Felt tip pens - Usually preferred in black, and available in varying widths, these produce a bold letter or diagram. Using different colored markers will often help a student to emphasize sections of his notes when scanning which would otherwise be quite difficult.
3. Acetate - Usually preferred in yellow, though available in various colors, acetate placed over the page will tend to darken the print itself as well as heighten the contrast of the background paper.
4. Lighting with rheostats - With variable intensities and positioning, the lighting can provide the additional or dimmed illumination that a visually handicapped child may require.
5. Large-type books - For comfort or for those children who cannot read regular print at close distance even with an optical aid, large-type is helpful. Its quality or typeface is as important to legibility as its size. Spacing between letters and lines is also important.
6. Bold-line paper - For children who find it difficult to see the lines on regular writing paper, bold lines are available in various formats, e.g., graph paper, large print staves for music notation.
7. Page markers and reading windows - These may be especially helpful to a child who finds it difficult to focus on a word or line of print.

8. Sun visors and other shields - Children with light sensitivity (photophobia) may need to block out some of the light and glare in the environment.
9. A photocopy machine can be used to darken and enlarge print on worksheets. The blue ditto master is very poor for visually impaired students. All worksheets used by teachers should be adjusted accordingly.
10. Persons with poor vision often have poor handwriting. They should be taught to use a keyboard at an early age (in addition to manual writing).

#### B. Tactual Aids

1. Raised line paper (writing paper, graph paper, etc.) - Raised line paper allows a student to write script "on the line" or to maneuver a graph either by placing markers onto the graph paper or by punching holes to indicate specific points.
2. Templates and writing guides - Made out of cardboard, plastic, or metal, these open rectangular forms allow signatures or other information to be written within their boundaries. Many blind people use these guides to sign their names.

#### C. Auditory Aids

1. Cassette tape recorders - Children use the recorder to take notes, listen to recorded texts, or formulate compositions or writing assignments.
2. Talking Book or other recording programs - The Library of Congress (Talking Book program) and other organizations provide free library services to visually handicapped persons, offering a wide variety of texts and leisure reading on disks and cassettes. Because the speed at which these disks and cassettes are played differ from the speeds of commercially manufactured recordings, the Library of Congress lends special Talking Book cassette machines to eligible persons.
3. Variable speed attachments - Attached to a tape recorder or Talking Book machine. These can be used to vary the speed at which the student listens to the tape, thereby speeding up or slowing down the rate of listening. (Speeding up the tape increases pitch.)
4. Speech compressors - These devices speed up recorded materials without changing the pitch.

#### D. Optical Aids

1. Tinted lenses - The light sensitive child may need to wear dark glasses indoors as well as out.
2. Magnifiers - Either hand held or in spectacles, magnifiers increase the size of the image reaching the eye. (It should be remembered that for some eye disorders, magnification can hinder rather than assist visual abilities.)

**Reference:** Corn and Martinez, 1967.

## Source Listing for Educational Materials

### **Cookbooks**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Catholic Guild  
Services for the Visually Impaired  
67 West Division Street  
Chicago, Illinois 60610

David White Company  
60 East 55th Street  
New York, New York 10022

General Mills, Inc.  
Box 114  
Minneapolis, Minnesota 55460

Quadrangle Books, Inc.  
10 East 53rd Street  
New York, New York 10022

Women's Club of Chevy Chase, Maryland  
7931 Connecticut Avenue  
Chevy Chase, Maryland 20015

### **Crossword Puzzles**

Large Print Publications  
11060 Fruitland Drive  
North Hollywood, California 91604

Simon and Schuster  
630 Fifth Avenue  
New York, New York 10020

### **Dictionaries**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Johanna Bureau for the Blind and Visually Handicapped, Inc.  
22 West Madison Street, Suite 540  
Chicago, Illinois 60602

Library Reproduction Service  
The Microfilm Company of California, Inc.  
1977 South Los Angeles Street  
Los Angeles, California 90011

National Association for Visually Handicapped  
3201 Balboa Street  
San Francisco, California 94121

Stanwix House, Inc.  
3020 Chartiers Avenue  
Pittsburgh, Pennsylvania 15204

### **Encyclopedias**

Keith Jennison Books/Franklin Watts, Inc.  
845 Third Avenue  
New York, New York 10022

National Association for Visually Handicapped  
3201 Balboa Street  
San Francisco, California 94121

### **Films on Visual Impairment**

American Foundation for the Blind  
15 West 16th Street  
New York, New York 10011

National Society for the Prevention of Blindness, Inc.  
79 Madison Avenue  
New York, New York 10016

### **Hymn Books**

Augsburg Publishing House  
426 South Fifth Street  
Minneapolis, Minnesota 55415

Bell and Howell Company  
Old Mansfield Road  
Wooster, Ohio 44691

Lutheran Braille Workers  
Sightsaving Division  
495 Ninth Avenue  
San Francisco, California 94118

Ulverscroft Large Print Books  
Oscar B. Stiskin, U.S. Sales Agent  
P.O. Box 3055  
Stanford, Connecticut 06905

## Lighting

Illuminating Engineering Society  
1860B  
345 East 47th Street  
New York, New York 10017

National Society for the Prevention of Blindness, Inc.  
79 Madison Avenue  
New York, New York 10016

National Education Association of the United States  
1201 Sixteenth Street, N.W.  
Washington, D.C. 20036

## Magazines

Know Your World  
American Education Publications  
Education Center  
Columbus, Ohio 43216

New Readers Press  
Box 131  
Syracuse, New York 13210

The New York Times - Large Type Weekly  
229 West 43rd Street  
New York, New York 10036

Readers' Digest Association  
Pleasantville  
New York 10570

## Magnifiers

American Thermo-Ware Company  
16 Warren Street  
New York, New York 10007

Apex Specialties Company  
1115 Douglas Avenue  
Providence, Rhode Island 02904

Apollo Lasers, Inc.  
5556 West Washington Boulevard  
Los Angeles, California 90016

Bausch & Lomb, Inc.  
Rochester  
New York 14602

Bernell Corporation  
316 South Eddy Street  
South Bend, Indiana 46617

Edmund Scientific Company  
555 Edscorp Building  
Barrington, New Jersey 08007

Edroy Products, Inc.  
130 West 29th Street  
New York, New York 10001

Keeler Optical Products, Inc.  
456 Parkway  
Lawrence Park Industrial District  
Broomall, Pennsylvania 19008

New York Association for the Blind  
Low Vision Services  
111 East 59th Street  
New York, New York 10022

## Periodicals

Education of the Visually Handicapped  
Association for Education of the Visually Handicapped  
919 Walnut Street  
Philadelphia, Pennsylvania 19107

DVH Newsletter  
Division for the Visually Handicapped: Partially Seeing and  
Blind Council for Exceptional Children  
1920 Association Drive  
Reston, Virginia 22091

Exceptional Children  
Council for Exceptional Children  
1920 Association Drive  
Reston, Virginia 22091



The Sight Saving Review  
National Society for the Prevention of Blindness, Inc.  
79 Madison Avenue  
New York, New York 10016

### **Piano Music**

Music Services Section  
Division for the Blind and Physically Handicapped  
Library of Congress  
Washington, D.C. 20542

Volkwein Brothers, Inc.  
117 Sandusky Street  
Pittsburgh, Pennsylvania 15212

### **Scouting**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

### **Sewing**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

The Catholic Guild for the Visually Impaired  
67 West Division Street  
Chicago, Illinois 60610

### **Song Books**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Ulverscroft Large Print Books  
Oscar B. Stiskin, U.S. Sales Agent  
P.O. Box 3055  
Stanford, Connecticut 06905

## Tests and Measurements

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Library Reproduction Service  
The Microfilm Company of California  
1977 South Los Angeles Street  
Los Angeles, California 90011

National Association for Visually Handicapped  
3201 Balboa Street  
San Francisco, California 94121

Volunteer Transcribing Services  
205 East Third Avenue, Suite 201  
San Mateo, California 94401

U.S. Civil Service Commission  
Bureau of Recruitment and Examining  
1900 "E" Street, N.W.  
Washington, D.C. 20415

## Textbooks - Large Type

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Arcata Microfilm, Southern  
Microfilm Division  
P.O. Box 1824  
7015 Alameda Road  
Houston, Texas 77001

Bell & Howell Company  
Micro Photo Division  
Old Mansfield Road  
Wooster, Ohio 44691

Braille Transcribers' Guild  
1807 Upas Street  
San Diego, California 92103

Cardinal Company  
1098 Harrison Street  
San Francisco, California 94103

Cascade Microfilm Systems  
208 James Street  
Seattle, Washington 98104

Dakota Microfilm Service  
P.O. Box 57  
St. Paul, Minnesota 55103  
or  
345 North Orange Avenue  
Orlando, Florida 32801

Foundation for Blind Children  
3720 North 75th Street  
Scottsdale, Arizona 85251

G. K. Hall and Company, Inc.  
70 Lincoln Street  
Boston, Massachusetts 02111

Harper & Row, Publishers  
Department 61  
10 East 53rd Street  
New York, New York 10022

The Jewish Braille Institute of America, Inc.  
110 East 30th Street  
New York, New York 10016

Johanna Bureau for the Blind and Visually Handicapped, Inc.  
22 West Madison Street, Suite 540  
Chicago, Illinois 60602

Keith Jennison Books/Franklin Watts, Inc.  
845 Third Avenue  
New York, New York 10022

Library Reproduction Services  
The Microfilm Company of California, Inc.  
1977 South Los Angeles Street  
Los Angeles, California 90011

National Association for Visually Handicapped  
3201 Balboa Street  
San Francisco, California 94121

Richards Rosen Press, Inc.  
29 East 21st Street  
New York, New York 10010

Stanwix House, Inc.  
3020 Chartiers Avenue  
Pittsburgh, Pennsylvania 15204

Ulverscroft Large Print Books  
Oscar B. Stiskin, U.S. Sales Agent  
P.O. Box 3055  
Stanford, Connecticut 06905

Volunteer Transcribing Services  
205 East Third Avenue, Suite 201  
San Mateo, California 94401

Volunteers Service for the Blind  
919 Walnut Street  
Philadelphia, Pennsylvania 19107

Xavier Society for the Blind  
154 East 23rd Street  
New York, New York 10010

Xerox Reproduction Center  
1616 North Fort Myer Drive  
Arlington, Virginia 22209

#### **Typewriters - Large Type (see local distributors)**

IBM  
Olivetti Underwood  
Remington Rand  
Royal  
Smith-Corona

#### **Typing Books**

American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

Stanwix House, Inc.  
3020 Chartiers Avenue  
Pittsburgh, Pennsylvania 15204

#### **Further Sources of Large Type Materials**

Central Catalog  
Instructional Materials Reference Center  
American Printing House for the Blind, Inc.  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

The Division for the Blind and Physically Handicapped  
Library of Congress  
Washington, D.C. 20542

National Association for Visually Handicapped  
3201 Balboa Street  
San Francisco, California 94121

Central Catalog of Volunteer-Produced Textbooks  
American Printing House for the Blind  
1839 Frankfort Avenue  
Louisville, Kentucky 40206

**Reference:** Harley & Lawrence, 1977.



## SECTION VI

### Funding

Rationale  
Procedure  
Example  
Sources





## FUNDING

The purpose of this section is to give direction to people who are seeking funding for adaptive equipment. The suggestions found here are meant to be a starting point for people who have had no experience in obtaining funds for the purpose of obtaining adaptive equipment.

Selection of adaptive equipment is based on the individual's limitations and need. The specific equipment chosen will be based on factors such as:

Purpose: Adaptive/habilitative

Present and future needs

Physical abilities

Cognitive abilities

Academic skills

Language skills

Environmental constraints

Programmatic goals

Cost/durability/functionality

## STEPS FOR SECURING FUNDING

Designate one person to coordinate the process of securing funds to avoid duplication of effort or elimination of important sources. Several people may work on a case, but it is usually most efficient to appoint one person to act as coordinator.

Determine potential sources. The list which follows is taken from Operating Purchase Programs, a book published by the National Easter Seal Society for Crippled Children and Adults.

Personal and family resources

Private insurance, industrial insurance

Campus government programs  
Crippled Children's Services  
Medicaid  
Office of Economic Opportunity programs  
Social Security  
Veteran's Administration  
Vocational Rehabilitation programs  
Easter Seal Society  
United Cerebral Palsy  
Service organizations: Elks, Shriners, Kiwanis, Optimists  
Trust funds

Of course, the individual or family may pay for the aid. Even if they are unable to pay for the entire cost, they may want to pay a portion.

For alternate funding sources, insurance agencies should generally be approached next, followed by government programs. There will be variations between regulations for federal and state programs as there will be differences in the interpretation of regulations governing these types of requests. Acceptance of requests will often depend upon whether a precedent has already been set and whether the individuals in the program are aware of the specific problems of the handicapped population, and whether there are funds available.

Even if you are turned down or know that people have been turned down, each application serves another function; that of consciousness raising within the community and making persons aware that there are unmet needs in the community. Other physically handicapped persons who have adaptive equipment may also be able to relate the course of action they took in obtaining their equipment.

Provide information to the funding source. Information can be provided initially through a letter, followed by a personal interaction to explain or demonstrate, in greater detail, the specifics of the request and to answer any questions the source may have. The information provided should include:

- a. Background information about the client.
- b. Prognosis for independent functioning with and without the device and a statement of current skills.
- c. Doctor's prescription - This is not always necessary but often may be, especially if you are applying to a medically-oriented agency. Again, this documentation may be more influential if it comes from a doctor who has been working with the physically handicapped population.
- d. Descriptor of the equipment that includes the special features of the aid as it relates to and will meet the client's particular needs. The implications of the purchase of the equipment for the individual's future growth and development as well as his/her present use should be described. This statement may include discussion of potential influences the aid may have on vocational considerations for the individual.
- e. Financial information may also be needed. Most devices will have a great impact on all aspects of a child or adult's life. Of particular significance to a funding agency may be the educational or vocational impact if that is their primary area of involvement. Other agencies will be more concerned with medical aspects of the case.

Arrange for financing. Once the agency agrees to fund an aid, there are financial arrangements that must be formalized such as proper invoicing and letters of confirmation. When several organizations have agreed to share the

cost, it is imperative that each be informed of the funding arrangements and that copies of the detailed agreement be available to each participant.

Upon receipt of the equipment, a letter of acknowledgement and appreciation from the handicapped individual and his/her family to the funding source would be appropriate.

## SAMPLE LETTER

Dr. Blaylock  
Medical Consultant  
Sunstream Insurance Company

Re: Boyd Hamtom

Dear Dr. Blaylock:

Boyd Hamtom is a 20-year-old man with achondroplasia. He is ambulatory; however, he has limited movement due to spinal and leg abnormalities that interfere with normal daily movement. He was seen at the Developmental Center for Handicapped Persons on April 2, 1985 for evaluation of his current motor skills and recommendation for possible adaptive assistance.

Boyd can ambulate with a walker for a few feet before tiring. His balance is poor. He is unable to negotiate stairs. He cannot bend or stretch more than a few degrees without experiencing pain.

Boyd is currently living at home with both parents, who are retired and on a limited income. Boyd is employed in a rehabilitation center for four hours a day. He would like to live in his own apartment when he can find one that will meet his needs.

The evaluation team determined that there is an adaptive device available that will meet Boyd's fine motor needs and increase his level of functional independent living. It is a reacher or extender. This device can be operated with one hand (trigger style) or with two hands (giant tongs). It also comes in many lengths. The length Boyd needs is 26 inches to help him compensate for his stature of 38 inches.

Use of this device will provide for the following independent activities in daily living:

1. It will allow Boyd to open and close both high and low cupboards without bending or stretching.
2. It will provide access to high places as his poor balance prohibits him from using a step or stool.
3. It will relieve Boyd from pain while doing daily tasks.
4. It will make all the functional spaces in Boyd's house available to him.
5. It will increase the speed at which Boyd can accomplish daily tasks and make him an independent and active individual who can function in his own home.

This device costs \$37.55 and is available from: Company name  
Address

If you require any additional information to process this claim, please call me at XXX-XXXX.

Sincerely,  
Physical Therapist

## POSSIBLE FUNDING SOURCES

This list is meant to be illustrative of possible routes to follow and is adapted from a reference by De Pape and Krause (1977).

### Personal and/or Family Resources

Low interest bank loans, savings, and personal income.

### Insurance Companies

Existing policy and special riders.

Although insurance companies are potential sources of funding, there has been inconsistency in the success of contacts with them. The two major issues appear to be:

- (1) type of coverage and
- (2) the medical condition resulting in the need for an augmentative device.

Questions regarding what is actually covered in a policy or concerns about rejected claims which appear to be legitimate should be addressed to the State Insurance Commissioner's Office.

### Government Funded Programs

Some federal programs may provide funds for the purchase of adaptive equipment. The objectives of each program and the problems that are addressed will determine whether a given request will be approved.

#### **Health Services Administration Public Health Service Department of Health, Education, and Welfare**

- Objectives: To provide financial support to states.
- (1) To extend and improve (especially in rural areas suffering from severe economic distress) medical and related services to crippled children and children suffering from conditions that lead to crippling.
  - (2) For special projects of regional or national significance which may contribute to the advancement of services for crippled children.

Assistance: Formula grants  
Project grants

For further  
information: Regional Health Administration, HEW Regional Offices

Headquarters:  
Associate Bureau Director MCH  
Bureau of Community Health Services  
Room 7-15, Parklawn Building  
5600 Fishers Lane  
Rockville, MD 20857  
(301) 443-6600

### **Handicapped-Early Childhood Assistance**

Objective: To support experimental preschool and early childhood programs for handicapped children.

Eligibility: Public agencies and private nonprofit organizations.

For further  
information: Handicapped Children's Early Education Assistant  
Program Development Branch  
Division/Innovation and Development  
U.S. Office of Education  
400 Maryland Avenue, S.W.  
Washington, D.C. 20202  
(202) 345-4722

### **Handicapped Innovative Programs - Programs for Severely Handicapped Children**

Authorization: Education of Handicapped Children Act, Title VI, Part C,  
Section 624, Public Law 91-230: 20 U.S.C. 1424

Objectives: To improve and expand educational/training services for severely handicapped children and youth; and improve the general acceptance of such people by general public, professionals, and possible employers.

Assistance: Project grants

For further  
information: Program Officer, Projects for Severely Handicapped  
Children and Youth, Special Services Branch  
Bureau of Education for the Handicapped  
400 Maryland Avenue, S.W.  
Washington, D.C. 20202  
(202) 472-4825

### **Rehabilitation Services and Facilities - Special Projects**

**Objectives:** To improve and expand educational/training services for severely handicapped children and youth; and improve the general acceptance of such people by the general public, professionals, and possible employers.

**Assistance:** Project grants

**For further information:** Program Officer, Projects for Severely Handicapped Children and Youth, Special Services Branch  
Bureau of Education for the Handicapped  
400 Maryland Avenue, S.W.  
Washington, D.C. 20202  
(202) 472-4825

### **Rehabilitation Services and Facilities - Special Projects**

**Objectives:** To provide funds to state vocational rehabilitation agencies and public or nonprofit organizations for project of expanding and otherwise improving services for the mentally and physically handicapped over and above those provided by the Basic Support Program Administration by states.

**Assistance:** Project grants

**Eligibility:** Projects with industry-employees and other organizations, and all other public or private nonprofit institutions or organizations or state agencies.

**For further information:** Regional or local office:  
State Vocational Rehabilitation Offices or RSA Regional Office  
Headquarters:  
Division of State Program Financial Operations  
Rehabilitation Service Administration  
Office of Human Development  
Office/secretary  
Department of Health, Education, and Welfare  
Washington, D.C. 20201  
(202) 345-0085

### **Medicare**

**Objectives:** To provide hospital insurance protection for covered services to any person 65 or above and to certain disabled persons.



Assistance: Direct payments for specified use

For further  
information: Local Headquarters:  
Bureau of Health Insurance  
Room 700, East High Rise  
Social Security Administration  
Baltimore, Maryland 21235  
(301) 594-9000

### **Supplemental Security Income**

Objectives: To provide supplemental income to persons ages 65 or over  
and to persons blind and disabled.

Assistance: Direct payments with unrestricted use

For further  
information: Local office

### **Social Security - Disability Insurance**

Objectives: To provide part of the earnings lost because of a physical  
or mental impairment severe enough to prevent a person  
from working.

Assistance: Direct payments for unrestricted use

For further  
information: Local office  
Headquarters:  
Bureau of Disability Insurance  
Room 760, Altmeyer Building  
Social Security Administration  
Baltimore, Maryland 21235

### **Service Clubs**

Many service clubs may take on a special project, such as raising funds for a communication aid, while others will donate unrestricted monies toward the purchase of an aid.

Service clubs' reactions to such requests will vary depending upon their specific priorities and how they prefer to provide community service and individual assistance.

Approaching local chapters or groups is highly recommended. Headquarter addresses are provided.

\*Civitan International  
P.O. Box 2102  
Birmingham, Alabama 35201

Service organization of business and professional men and women interested in promoting good citizenship on local, national, and international levels. One of its projects is "Aid to the Physically and Mentally Handicapped."

\*Lions International  
400 22nd  
Oak Brook, Illinois 60521

International association of business and professional men to promote better international relations. Many service activities, including health service, services for hearing impaired.

\*National Ambucs  
P.O. Box 5127  
High Point, North Carolina 27262

Federation of local civic service clubs dedicated to principles of Americanism, brotherhood, and character; to promote a better community and personal life for its members. National project is providing aid to victims of cerebral palsy.

\*National Assistance League  
5627 Fernwood Avenue  
Hollywood, California 90028

"To act as a friend at any and all times to men, women, and children in need of care, guidance, and assistance, spiritually, materially, and physically." Each chapter controls and administers at least one philanthropic project of its own - including hearing, speech, and day nurseries.

\*Optimist International  
4494 Lindell Blvd.  
St. Louis, Missouri 63108

International federation of business, industrial, and professional men's service clubs. Member clubs are dedicated to inspiring respect for law, aiding and encouraging development of youth, promoting active interest in government and civic affairs.

\*Indoor Sports Club  
1145 Highland Street  
Napoleon, Ohio 43534

Social, benevolent, and rehabilitative organization for physically disabled persons. To provide entertainment and amusement for disabled persons and shut-ins, seek aid for needy disabled persons, provide opportunities for active participation in civic affairs, and promote a better understanding and acceptance of the seriously disabled by the able-bodied.

\*Round Table International  
59 East Colorado Blvd.  
Pasadena, California 91101

Federation of men's service clubs, using the King Arthur legends to interpret the idea of service, and emphasizing work with youth, college, and high school students with special programs for handicapped and mentally retarded youth.

\*Sertoma International  
1900 East Meyer Blvd.  
Kansas City, Missouri 64132

Civic service club of business and professional men in all classifications. To render "Service to Mankind." Sponsors speech and hearing services, among others.

\*Service club descriptions are excerpts from the Encyclopedia of Associations, Margaret Fisk (Ed.), Vol. 1, National Organization of the U.S., 11th Ed., Gate Research Co., 1977.

#### Information Sources

##### Special health organizations:

- May provide direct financial assistance in the purchase of adaptive devices.
- May know of specific community resources which could be tapped (such as trust funds or local foundations).
- May advocate for funds to other organizations.

American Parkinson Disease Association  
147 East 50th Street  
Suite 103  
New York, New York 10022  
Phone: (212) 421-5390

AmVets (American Veterans of World War II, Korea, and Vietnam)  
1710 Rhode Island Avenue, N.W.  
Washington, D.C.  
Phone: (202) 223-9550

Closer Look  
Box 1492  
Washington, D.C. 20013  
Phone: (202) 833-4163

Communications Foundation  
600 New Hampshire Avenue, N.W.  
Washington, D.C. 20037  
Phone: (202) 333-0800

Muscular Dystrophy Association, Inc.  
810 Seventh Avenue  
New York, New York 10019  
Phone: (212) 586-0808

Myasthenia Gravis Foundation  
230 Park Avenue  
New York, New York 10017  
Phone: (212) 684-6387

National ALS Foundation, Inc.  
185 Madison Avenue  
New York, New York 10016  
Phone: (212) 679-4016

National Association for the Physically Handicapped  
76 Elm Street  
London, Ohio 43140  
Phone: (614) 852-1664

National Easter Seal Society for Crippled Children and Adults  
2023 West Ogden Avenue  
Chicago, Illinois 60612  
Phone: (312) 243-8400

National Multiple Sclerosis Society  
205 East 42nd Street  
New York, New York 10017  
Phone: (212) 532-3060

Phone: (304) 697-2638

Phone: (201) 838-2500

Phone: (212) 889-6655

## Sources of Adaptive Equipment

Abbey Medical  
44 East 600 South  
Salt Lake City, UT 84115

Adaptive Therapeutic Systems, Inc.  
162 Ridge Road  
Madison, CT 06443

Childsafe  
P.O. Box 633  
Pacific Palisades, CA 90272

DanMar Products, Inc.  
2390 Winewood  
Ann Arbor, MI 48103

Everest & Jennings  
1803 Pontius Avenue  
Los Angeles, CA 90025

Fred Sammons, Inc.  
Box 32  
Brookfield, IL 60513-0032  
800-942-2129

G. E. Miller, Inc.  
484 South Broadway  
Yonkers, NY 10705

Gerber Family Health Care  
445 State Street  
Fremont, MI 49501  
800-253-3078

Gopher Athletics  
220 24th Avenue N.W.  
Owatonna, MN 55060

Halbrand, Inc.  
4413 Haybrand Parkway  
Willoughby, OH 44094

J. A. Preston  
71 Fifth Avenue  
New York, NY 10010

L. Mulholland Corporation  
215 North 12th Street  
Santa Paula, CA 93060

Medco  
Rehabilitation Aids Co.  
P.O. Box 146  
East Rockaway, NY 11518

The Nurtury  
Teledyne Water Pik  
1730 East Prospect Street  
Fort Collins, CO 80521

Ortho-Kinetics, Inc.  
P.O. Box 432  
Waukesha, WI 53187  
800-558-7786

Prentke Romich  
R.D. 2, Box 191  
Shreve, OH 44676

Robinsons Medical Mart  
235 East 6100 South  
Salt Lake City, UT 84107  
and other major cities

Rolyan Medical Products  
14635 Commerce Drive  
Menomonee Falls, WI 53051

Ruper Industries  
P.O. Box 624  
Wheeling, IL 60090  
(E-Z-On Harness)

Safety Travel Chairs  
147 Eady Court  
Elyria, OH 44035

Sears Home Health Care Catalog  
Local Sears store

Telesensory Systems  
3408 Hillview Avenue  
P.O. Box 10099  
Palo Alto, CA 94304

Things from Bell  
4 Lincoln Avenue  
P.O. Box 706  
Cortland, NY 13045

Ty-D-Saddle  
P.O. Box 612  
Lava Hot Springs, ID 83246

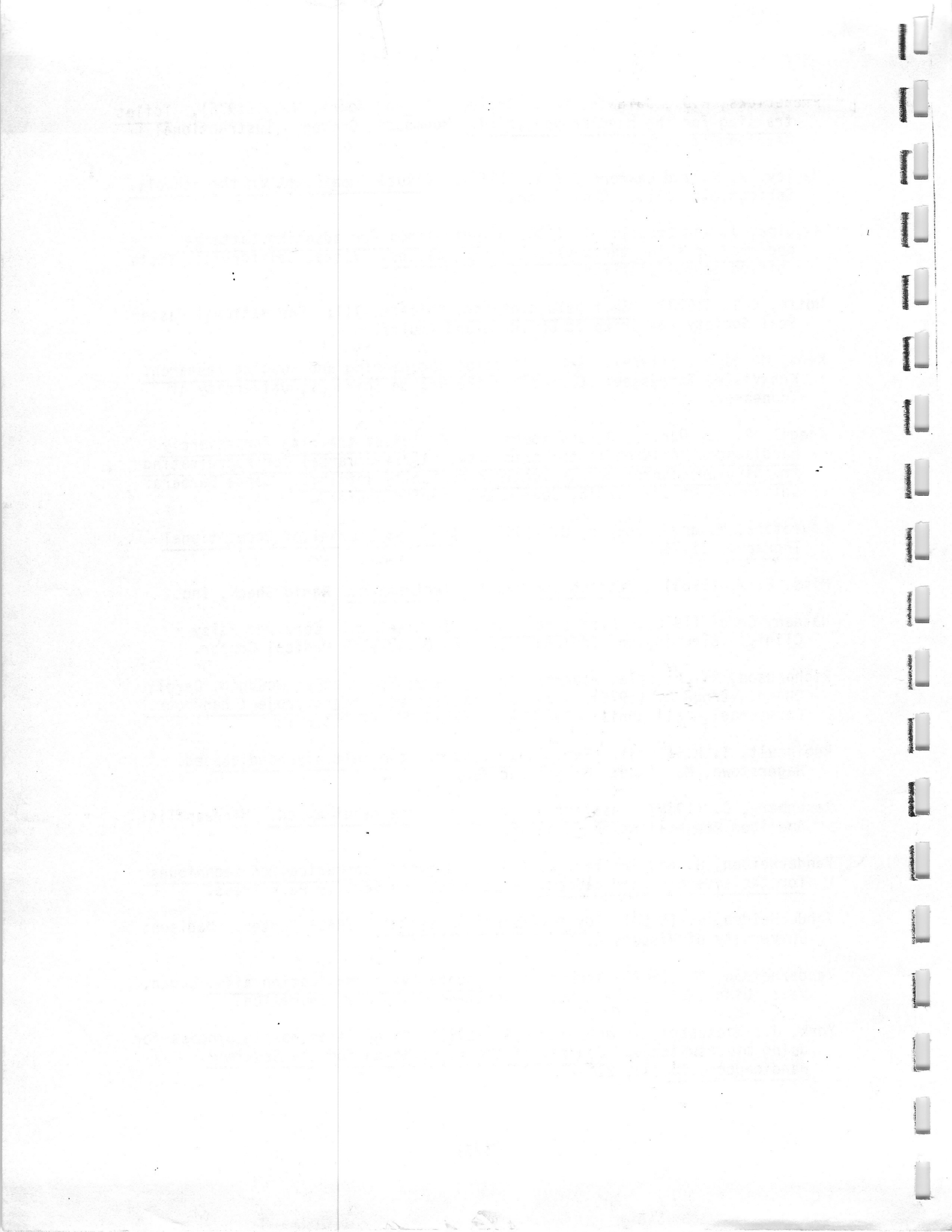
Zygo Industries, Inc.  
P.O. Box 1008  
Portland, OR 94207-1008

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- VanderHeiden, G. (1980) Toy modification reprint. TRACE Center. Madison: University of Wisconsin.
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## Urine Sensor Device for Toilet

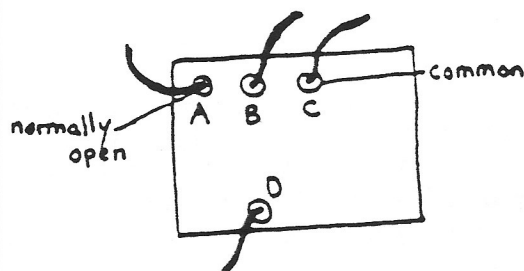
**Purpose:** This device is placed in a dry potty chair and is activated when wet. A reinforcing event, such as music, light, or battery-operated toy, is turned on automatically when the device is activated, thus reinforcing appropriate urination.

**Suggested Use:** For use during toilet training. Permits immediate reinforcement, contingent upon urination.

**Materials:** "Safe House Water Alarm" from Radio Shack or other similar battery-operated flood alert device, 5' of two conductor, 22 gauge, stranded wire, 1 subminiature size plug, 2 strips of brass or copper about 1/4" x 2", 1 6-9 VDC relay (Radio Shack #275- 004), masking tape, hot glue with applicator gun, rosin core solder, soldering iron.

### **Construction:**

1. Remove the cover of the water alarm and unscrew the buzzer. Clip off both wires connected to the buzzer about 1/2" from the buzzer. You will not need the buzzer for this project but it might come in handy for some other device. Carefully strip about 1/4" of the plastic coating off the ends of the wires that you cut.
2. Cut out the cardboard template on the back of the package that the relay came in. Punch the 4 holes as shown in the diagram below. Thread the wires of the relay through the holes and tape it to the cardboard. Note: The fifth wire, "normally closed," will not be used. It can be folded up under the relay and taped out of the way.



3. Twist together and solder one wire that was connected to the buzzer to wire "B" as shown in diagram above. Note: This is the wire from the relay that goes to one side of the coil.
4. Twist together and solder the other wire that was connected to the buzzer to wire "D" of the relay. Note: This is the other wire of the relay that goes to the coil.